Energy Use in Rural Areas of Uttarakhand in Uttar Pradesh

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CHAPTER I

INTRODUCTION

I. Background and Objectives

The perception of the energy problem has passed through a number of phases begining with the OPEC oil-shock of 1973. The initial concern, naturally, was with the price and availability of petroleum and other fossil fuels. There was a clear perception of crisis globally as the world had, till the early seventies, taken unlimited quantities of cheap petroleum almost for granted. The entire structure of economic growth in the post-war period had been built on this fact. The dramatic increase in oil prices which began with the OPEC action in 1973 and continued for the rest of the decade, sent alarm bells ringing all through the world. The worst affected, of course, were the oil importing developing countries as they faced the twin threats of balance of payments crisis and serious disruption of the process of economic growth. The energy crisis, therefore, was first seen in terms of the oil crisis which involved problems of price and availability.

In course of time, however, another dimension of the energy problem acquired prominance, especially in the developing countries of the Third World, viz., the energy problem in the household sector of the rural areas. This

has been aptly termed "the other energy crisis" (Eckholm,). As the attention of the world was turned towards energy as a crucial part of the infrastructure needed for economic growth and the need for energy planning and management arose, it also came to be realised in the developing countries that the major consumer of energy is the household sector. This sector,moreover,is predominantly dependent on traditional or non-commercial fuels like fuelwood, animal dung and crop residues for meeting its energy needs especially for cooking. Over the years, vast millions in the rural areas of the developing world have been facing an energy crisis no less serious than the oil crisis. They face, on the one hand, a serious shortage of fuel for meeting their basic energy needs like cooking with the result that they have to spend more time and travel longer distances for collecting their fuel sources. On the other hand, owing to greater urbanisation and increasing economic activity, they also face the none-too-pleasant prospect of commercialisation or monetisation of energy source that have been available free so far.

Some idea of the dimensions of this 'other' energy problem in India can be had from estimates of commercial and non-commercial energy consumption for 1975-76 made by CASE and quoted by Khoshoo (1986 :146). According to this estimate the total energy consumption in India in

1975-76 was 447.3 Million Tonnes of Coal Replacement (MTCR), of which commercial energy constituted 56.5 per cent (252.7 MTCR) and non-commercial energy 43.5 per cent (194.6 MTCR). Furthermore, in 1978-79, the household sector in India accounted for only 13.7 per cent of total energy consumption as compared to 38.5 per cent by industry, 31.7 per cent by transport and 10.6 per cent by agriculture (Khoshoo, 1986:147).

The heavy dependence on non-commercial energy sources such as fuelwood, animal dung, crop residues by large sections of the society in India for meeting their domestic energy needs has serious implications for energy policy and planning. This fact has been recognised by the Advisory Board of Energy. In its second set of recommendations submitted to the Government of India in February 1984 it has clearly stated :

> The time has come to make the task of meeting the energy demand of household everywhere, but particularly of the rural and urban poor, a principal element of our energy strategy in the Seventh and subsequent plans. The challenging task of meeting the energy requirements of households must be accorded top priority and the necessary supportive social, technological and institutional changes effected. Unless this is done, the problem will continue to be ignored and will get out of hand. A deliberate and special effort is needed because this section of our population lacks organisational strength and often cannot conceptualise and articulate such concern forcefully. An energy policy cannot be divorced from an inherent set of priorities that is linked to our vision of what type of society we want to establish. We believe therefore,

that domestic energy requirements are a minimum need that the government should undertake to fulfil (Advisory Board on Energy, 1984 : 76. Emphasis ours).

Planning for, and implementing, an energy policy for the poverty-prone domestic sector is admittedly a difficult task in a country like India where about 40 per cent of the total population lives below the officially defined poverty line and is heavily dependent on free collection for their fuel needs. The complexity of the task becomes even greater when we bear in mind that we do not have any reliable estimates at the national state or sub-regional level of the energy consumption pattern i.e. the quantum and sources of energy, of this all-important sector.

The present study is an attempt to fill this gap in information in a small way for one region viz., Uttarakhand in the state of Uttar Pradesh. The objectives of the study are :

i. to assess the pattern of energy consumption in the rural areas of Uttarakhand;

ii. to estimate the consumption of different sources of energy and to relate them to their end uses;

iii. to determine how the rural households meet their energy needs and what are the problems associated with different sources of energy;

iv. to identify the strategy that may be adopted to ameliorate the energy problem in the rural areas of Uttarakhand.

II. Area and Its Characteristics

Uttarakhand is the name generally given to the himalayan region located in the north-western part of Uttar Pradesh. Administratively it is divided into eight districts viz., Almora, Nainital, Pithoragarh, Chamoli, Pauri(Garhwal), Dehra Dun, Tehri Garhwal and Uttar Kashi. The first three comprise the Kumaon Division and rest form the Garhwal Division. Geographically it is a distinct region known as the Central Himalayan region. Uttarakhand lies between 28°.51' and 31°.90' North latitudes and 78°.00' and 81°.03' East longitudes. Almost the entire region is mountainous except for a narrow strip of land consisting of the Bhabar, Tarai and the Dun valley, and which , which borders the Gangetic plain of U.P. The altitudes in the region vary from about 700m above Mean Sea Level at the foothills to several thousand meters on the great himalayan peaks like Nanda Devi. The topography of the region is uniformly undulating with only a few fertile river valleys. It contains the sources of some of the major river-systems of northern and easter India viz. the Ganga and the Yamuna.

The area of Uttarakhand is 51,125 Sq.Km. and its population according to the 1981 Census was 48,35,712. Over 81 per cent of the population is rural. The

region accounts for 17.4 per cent of the states area and 4.2 per cent of its population.

Land use data for the region as a whole are given in Table 1.1.

Table 1.1 : Land Use in Uttarakhand : 1980-81

(Area in Hectares)

		Area	%
1.	Total reporting area for land use purposes	53,26,593	100.00
2.	Forests	34,43,392	64.65
3.	Barren & uncultivable land	2,89,631	5.44
4.	Land put to non-agricultural use	1,18,126	2.22
5.	Uncultivable waste	3,15,880	5.93
6.	Permanent pastures and other pastures	2,17.238	4.08
7.	Area of miscellaneous trees, groves etc. not included in net area sown	1,85,559	3.48
8.	Current fallow	20,615	0.39
9.	Other fallow	31.963	0.60
10.	Net area sown(NAS)	7,04,189	13.22
11.	Area sown more than once	4,43,553	
12.	Net area irrigated (NAI)	2,01,530	
13.	NAI as % of NAS		28.62

Source : Uttar Pradesh ki Krishi Ankare, 1980-81

It will be seen from the table about 65 per cent of the area of Uttarakhand is classified as forest. This may be compared with the situation in Uttar Pradesh as a whole where only 17 per cent of the area is under forests. In fact Uttarakhand accounts for 67 per cent of the total

forest area of Uttar Pradesh. However, it may be pointed out that the entire area classified as forests may not actually be under tree cover because the official data include all land legally classified as forests land in the category of forests. It is well known that large areas of forests are degraded, denuded and sometimes totally devoid of any vegetation whatsoever. This fact is not reflected in the official data. Thus the estimates of forests area are likely to be inflated. For instance, the National Remote Sensing Agency (NRSA) using land sat imagery has estimated that in 1980-82 forest area in Uttar Pradesh was only 21022 sq.km. ie., about 7 per cent of the total area of the state (Khoshoo, 1986, 41). If we assume that 70 per cent of the state's forests are located in Uttarakhand, we find that not more than 28 per cent of its total area is actually forested. This is a far cry from what the land use data show or from the recommendation of the National Forest Policy (1952) that 60 per cent of the area in hilly regions should be under forest cover.

The extent of forest area has an important bearing on the rural energy problems of Uttarakhand. As we will see later, most of the households are almost totally dependent on fuelwood for their domestic energy needs. If the forest cover is not adequate then it will have serious consequences for the preservation of the forests

and ultimately of the ecological balance not only in the hill areas but also in the adjoining plains. Demographic pressures are hound to push up the demand for fuelwood in the years to come leading to further strain on the already fragile forest resources.

Another notable feature of the data in Table 1.1 is that net area sown constitutes only 13 per cent of the total area of Uttarakhand. For the state as a whole the corresponding figure comes to 58 per cent. This is a consequence of the topography of the region. Being for the most part mountainous, cultivation is possible only in certain parts, mainly the fertile river valleys or the gentle slopes where terraced fields can be constructed. In fact, the aggregate land use statistics for Uttarakhand give a misleading picture of the actual area cultivated in the hilly part, because they also contain data for Naini tal and Dehradun districts which have substantial areas of good fertile land located in the plains the former in the Tarai and the latter in the Dun Valley. Thus net area sown as a percentage of total area in 29 per cent in Naini Tal and about 18 per cent in Dehra Dun, while in the remaining six districts it is only 10 percent. Furthermore, Naini Tal and Dehra Dun together account for 37 per cent of the net area sown in Uttarakhand.

The impact of topography can also be seen in the

availability of irrigation. Net irrigated area as a per cent of net area sown was about 29 in Uttarakhand as compared to about 55 in the sta te as a whole in 1980-81. In Naini Tal net area irrigated as a percent of net area sown was 65 while it was 42 in Dehra Dun in 1980-81. In the remaining six districts of Uttarakhand it was only about 10 per cent. Thus Naini Tal and Dehra Dun together contain over 78 per cent of the net irrigated area in Uttarakhand.

We have dwelt at some length on the land use date, particularly cultivated area and irrigated area, because we feel that it is a major factor influencing the living conditions of the rural people in Uttarakhand which, in turn, has an impact on the energy consumption patterns and the energy problems faced by the people. The basis for such an assertion is the fact that the economy of the region is predominantly agricultural with very little diversification of economic activities. The only exceptions are the Tarai belt of Naini Tal District and the Doon Valley. Tables 1.2 and 1.3 give the sectoral conposition of net output in 1981-82 and the occupation distribution of main workers as per the 1981 census in the hill region and the state.

Table 1.2

Sectoral Composition of Net Output(Commodity Producing Sectors Only) in Uttarakhand : 1981-82

(Current Prices)

District/Region	Percentage Share in Total Output		
	Agriculture & Allied	Forestry & logging	Manufacturing (Regd & Unregd)
Uttarkashi	44.9	50.7	4.4
Chamoli	56.1	39.7	4.2
Tehri Garhwal	75.3	21.2	3.4
Dehra Dun	45.5	9.4	44.1
Garhwal (Pauri)	81.9	14.8	3.3
Pithoragarh	82.1	12.9	5.0
Almora	81.7	12.0	6.3
Naini Tal	61.4	22.5	11.2
Uttarakhand	65.9	21.4	11.1
Uttar Pradesh	74.6	2.3	22.0

Source : Government of Uttar Pradesh, Draft Seventh Five Year Plan (1985-90) and Annual Plan 1985-86 (January 1985).

Table 1.3

Occupation Distribution of Main Workers : Uttarakhand, 1981

District/Region	Percent of Main Workers			
	Cultivators	Agricul-tural labourers	House hold industry	Other workers
Uttarakashi	78.7	0.6	1.1	19.6
Chamoli	80.9	0.3	2.0	16.8
Tehri Garhwal	85.1	0.3	0.7	13.9
Dehra Dun	27.9	7.9	1.3	62.8
Garhwal (Pauri)	71.5	0.8	0.9	26.8
Pithoragarh	78.1	0.6	2.2	19.1
Almora	73.3	1.6	1.5	23.6
Naini Tal	44.7	19.1	2.0	34.2
Uttarakhand	63.8	5.5	1.5	29.2
Uttar Pradesh	58.5	16.0	3.7	21.8

Source : Census of India (1981).

It will be seen from Table 1.2 that agriculture and allied activities and forestry and logging together contribute about 87 per cent of the net output in Uttara khand as compared to about 77 per cent in the state as a whole. At the other end, manufacturing (both registered and unregistered) contributes only 11 per cent of the net output in Uttarakhand as against 22 per cent in the state. Furthermore, Dehra Dun and Naini Tal account for most of the industrial output in the hill region. In Dehra Dun 44 per cent of the output comes from manufacturing while the share of agriculture and allied activities and forestry and logging is 55 per cent. In Naini Tal, manufacturing contributes 11 per cent and the share of the two other sectors is about 84 per cent. In the remaining six districts, which as we have noted earlier are predominantly hilly, the share of the primary sector (agriculture and allied activities and forestry and logging) in net output varies between 94 and 97 per cent while the share of manufacturing is uniformly low-varying between 3 and 6 per cent.

The distribution of main workers according to major occupation groups in 1981 (Table 1.3) only confirms this fact about the structure of the economy in Uttarakhand. In the region as a whole about 69 per cent of the main workers are engaged in agriculture (either as cultivators or as agricultural labourers) as compared to 74.5 per cent

in the state. The proportion of workers in household industry is only 1.5 per cent as compared to the state average of 3.7 per cent. As a result a much higher proportion of workers is engaged in other services in Uttarakhand (29 per cent) than in the state (about 22 per cent). However, since the share of manufacturing in the total output is much lower in Uttarakhand than in the state, it may be presumed that only a small proportion of the workers in the other services would be engaged in the manufacturing sector-except perhaps in Dehra Dun and to some extent in Naini Tal. Thus most of the 'other workers' in Uttarakhand would be engaged in the service sector. It is also to be noted from Table 2.3, that apart from Dehra Dun and Naini Tal, the percentage of main workers engaged in agriculture in the other six districts is higher than the state average - 78 per cent in these districts as against 74.5 per cent in the state. In Dehra Dun the corresponding percentage is about 36 while in Naini Tal it is about 64. Another noteworthy feature of the data is the relatively high proportion of cultivators and the low proportion of agricultural labourers in Uttarakhand in general and in the six predominantly hill districts in particular as compared to the state as a whole. In Dehra Dun cultivators dconstitute 28 per cent of the main workers and in Naini Tal about 45 per cent. In all other districts they constitute 72 to 85 per cent of the main workers. Agricultural labourers, on the other hand, form an

insignificant part of the work force in all districts except Dehra Dun and Naini Tal. In Dehra Dun they constitute 8 per cent of the main workers and in Naini Tal 19 per cent (a figure which is higher than the state average of 16 per cent) while in the other six districts their proportion ranges between 0.3 per cent and 1.6 per cent. This seems to be a clear indication that except in Dehra Dun and Naini Tal, agriculture is largely a subsistence activity in Uttarakhand mainly carried out through family labour. It is only in the two former districts, and that too in the plains areas, that a measure of commercialisation has occured in agriculture. It is more marked in Naini Tal than in Dehra Dun.

In this context we would also like to point out that the pressure on land in Uttarakhand is quite heavy. This may appear, at first sight, a paradoxical statement because the density of population is rather low-the average density in the region is 95 persons per square kilimeter as against the state average of 377 according to the 1981 census. Overall density,however, is a misleading concept because only a small part of the area is either habitable or cultivable. If instead we look at the density of rural population per hectare of cultivated land, which gives a better idea of the pressure on land, we find that the figure for Uttarakhand was 5.61 in 1981-82 and for the state it was 5.28. For the six exclusively hill districts

it comes to 6.18. Thus we find that in Uttarakhand a relatively smaller land base than the state has to support a relatively larger population. The land base can only be expanded either by displacing forests or by extending cultivation to marginal areas like steep hill slopes. Both these options are likely to have serious environmental consequences like greater susceptibilitytto erosion and reduced water retention capacity which will ultimately threaten the productivity of all existing cultivated areas while at the same time having far-reaching consequences in the downstream areas of the gangetic plains. Thus the stability and health of hill agriculture ultimately depends on proper management and conservation of land, forest and water resources. Added to this is the urgency of proper energy planning and management in the region because the demand for energy needs, especially fuelwood, is also great.

III Coverage and Sample

The study has been conducted in eight locations- one in each district of the region. Thus the entire Uttarakhand region has been covered, with one significant exception. We have confined our study to only the hilly parts of the region. Thus the Tarai belt of Naini Tal district and the Dun Valley in Dehra Dun district have been excluded. The reason for their exclusion is that the energy problems faced by these areas are entirely different from those of the hilly areas. Their situation is more akin to

that of the plains region of the state than of the hilly areas. In selecting the locations for study we followed a two-stage process. In the first stage we identified different watersheds - main and subsidiary - in Uttarakhand. We then matched the watersheds with development blocks in the region so that we would get representation for each of the districts as well as the major watersheds. The watersheds were identified from the data collected by the directorate of Land Survey, U.P. Forest Department. This organisation has over the years delineated 28 watersheds, 119 sub-water sheds and 1150 micro watersheds in the hill region of Uttar Pradesh. The blocks were identified on the basis of census data. It may be mentioned that there are in all 75 development blocks in the light hill districts of Uttarakhand, out of which 67 blocks are located in the hilly areas.

Finally, in each of these locations we selected a cluster of villages on the basis of a field trip and observation. The villages were selected keeping the following criteria in mind :

(a) They should be located in the same micro-watershed.

(b) They should form a cluster with about 250 households in each cluster

(c) They should represent different altitudinal ranges with maximum number of villages in the altitudinal range of 3000 to 5000 feet above mean sea level as this range contains the maximum population in Uttarakhand.

Based on these criteria we selected 51 villages in all, spread over 8 blocks and 8 sub-watersheds of 8 districts in Uttarakhand. Since each cluster of villages contained about 250 households we surveyed each one of them on a census basis rather than go in for a sample. In all therefore we collected data from 2004 households. We feel that this is a large enough number to permit some degree of generalisation for the region as a whole. The details of the locations of the study are given in Table 1.4 below.

Information was convassed from the households in regard to their general social and economic characteristics like household size and characteristics, economic pattern, activity structure, land holding structure etc., and energy consumption pattern and problems associated with the availability of energy sources, on the basis of a specially prepared questionnaire. In addition we also used a village schedule to-gather information about the villages selected for study.

Chapter II of this study analysis the general socio-economic characteristics of the areas studied. In chapter III we present the data pertaining to the energy consumption pattern and go on to analyse the same. The problems encountered by the rural households in meeting their energy needs are discussed in chapter IV. This analysis

Table 1.4

LOCATION AND NAMES OF VILLAGES SELECTED WITH ATTITUDE RANGE AND NUMBER OF HOUSEHOLDS

District/Block/ Sub-watershed/ Micro watershed*	Villages	Altitude Range (in feet)	No.of Households
1. Nainital/Bhimtal/ Gola/Naukuchiya Tal	1) Thapalia Mehra Gaon 2)Nauladhara 3) Bijrauli 4) Bohragaon 5)Kharki 6) Chanauti 7) Pandegaon 8) Siloti Pant 9) Siloti Pande	4000-45000	235
2. Pithoragarh/Gangoli Hat/ Saryu Kuntola	1) Dwairala 2)Raingal 3)Kuntola 4) Sailana 5) Sela 6)Pawadhar 7)Kunaru	4500-5000	251
3. Almora/Chaukhutia/Ramganga Lower Kuthlad	1) Garhsari 2)Simpani 3)Merai 4)Dantola 5) Chhana 6)Basbhira 7)Ghangoli	3000-3500	248
4. Chamoli/Chamoli(Dasholi)/ Alaknanda/Birganga	1) Gwar 2)Kharki Gandhinagar 3)Siranji 4) Serokhamau 5)Dewaldhar	5500-6000	252
5. Pauri Garhwal/Pabau/West Nayar/Ladoligad	1) Sarna 2)Kulmauri 3)Bhatigaon 4)Saplandi 5) Chhani 6)Paligram	4500-5000	254
6. Uttarkashi/Dunda/Bhagirathi/Dhanarigad	1) Gwana 2)Darmali 3)Pujargaon	4000-4500	250
7. Tehri Garhwal/Jaunpur/ Aglar/Debligad	1)Danda-ki-Beli 2)Khanari 3)Nakurchi 4)Birkot 5)Dabali	6500-7000	260
8. Dehradun/Kalsi/Tons/ Bhatnalagad	1) Chandau 2)Desau 3)Kharmroli 4)Malau 5) Jisau 6)Khoyee 7)Sarau 8)Tipa 9)Chibau	4000-4500	254
* In subsequent analysis the village clusters are identified by the names of the respective micro-watersheds		Total	2004

is based on the perceptions and responses of the households. Finally in the concluding chapter, we summarise the main finding of the study and discuss same of the important issues arising from it as well as the strategy that may be adopted to ameliorate the energy problem in the rural areas of Uttarakhand.

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CHAPTER II

Socio-economic Characteristics of the Selected Village Cluster

In this chapter we have made an attempt to describe and analyse the broad features of the socio-economic characteristics of the eight village clusters selected for study. Our aim is to provide the general Socio-economic context of the area in which the study has been conducted, so that we may be able to relate the rural energy problems, analysed in the subsequent chapters, to the characteristics of the area. Accordingly we have covered issues like situation and description of the villages, demographic structure, caste composition of the population, literacy, activity pattern, pattern of landholdings and the nature of the household economy.

I. Location of Village Clusters

We have tried to look at the location of the village clusters from two perspectives viz. distance from major centres and facilities like nearest town, block headquarters district headquarters, pucca roads and post office and distance from forests-reserved and civil/soyam (Table 2.1). The first gives and idea of how isolated the villages are from main centres of activity while the second has a bearing on the availability of fuelwood which, as we shall see, is the main source of domestic energy. In terms of first criteria we find that the villages of Birganga

Table 2.1

Distance of Village Clusters from Major Centres and Facilities

(Distance range in Kms*)

Distance from nearest	Village Clusters							
	Nauka-chiyatal	Kuntola	Lower Kuthlad	Birganga	Ladoli-gad	Dhana-rigad	Debli-gad	Bhatna-lagad
Town	3-4	10-11	4.5-6	4-6	1.5-3	8	4-7.5	14-17
District hq.	25	87	90	5.5	15	25	68	80
Block hq.	3-5.5	13-14	4.5-6	4-6	3-6	8	8-17.5	15-35
Post office	0.5-1.5	0.5-2	0.25-2.5	0.25-2	1.5-3	0	4-7.5	14-17
Metalled Road	0.5-1.5	10-11	0.25-2.5	0.25-1	1.5-3	6	4-7.5	14-17
Reserve Forest	7-12	0.5-2	0.5-1	0.5-1	0.5-6	2.5-5	1-3	5-7.5
Civil/Soyam Forest	1-2	0.25-1	0.25-3	0.25-3	-	1-2	1-2	1.5-4

*Gives the distance of the nearest and farthest village in the cluster from the facility concerned.

(Chamoli District), Lower Kuthlad (Almora District), Ladoligad Pauri District) and Naukuchiyatal (Naini Tal District) clusters are the most favourably located. The villages in the Dhanarigad (Uttarkashi District) and Debligad (Tehri Garhwal District) clusters are somewhat more remote in terms of distance from major centres and key facilities. The only facility readily available within the Dharigad cluster is a post office. Kuntola (Pithoragarh District) and Bhatnalagad (Dehra Dun District) clusters have the most unfavourable locations. The villages in the latter clusters are the furthest away from important centres and facilities.

As far as distance from forests is concerned, we find that the villages in the Nukuchiyatal clauster are the furthest away from reserved forests-being situated at an average distance of 7-12 kms. followed by those in the Bhatnalagad and Dhanarigad clusters. The remaining clusters have reserved forests within a distance of 0.5 to 3 kms. The Civil/Soyam forests, where available, are in general situated closer to the villages than the reserved forests and in no case are they located more than 4 kms. away. However, it has been generally observed that the condition of Civil/Soyam forests, which are under the control of the revenue authorities, is none too good in Uttarakhand, with the result that the people have to depend on reserved

Table 2.8

Area, Production and Yield of Principal Crops in the Selected Village Clusters

A = Area in Acres
P = Production in Quintals
Y = Yield in Quintals per acre

	Wheat			Paddy			Mandua		
	A	P	Y	A	P	Y	A	P	Y
Naukuchiya Tal	201.80	623.50	3.09	70.25	371.52	5.28	-	-	-
Kuntola	114.03	320.46	2.81	68.40	509.55	7.45	26.50	106.45	4.02
Lower Kuthlad	141.43	1038.99	7.35	150.45	1406.41	9.35	45.05	244.80	5.43
Birganga	138.79	675.10	4.86	142.85	1168.02	8.18	76.26	471.97	6.19
Ladoligad	160.10	1426.90	8.91	175.36	1711.00	9.76	72.08	1027.40	14.25
Dhanarigad	235.88	3023.00	12.82	210.12	4197.85	19.98	66.15	1271.84	19.23
Debligad	63.55	523.49	8.24	81.67	725.85	8.89	27.95	340.30	12.18
Bhatnalagad	422.71	372.50	0.88	21.33	39.50	1.85	329.35	539.90	1.64
TOTAL	1478.29	8003.94	5.41	920.53	10129.70	11.00	643.34	4002.66	6.22

* Includes Vegetables

@ Mainly Maize

Table 2.8 (Contd.)

	Potato			Pulses			Others*	
	A	P	Y	A	P	Y	A	P
Naukuchiya Tal	1.80	7.50	4.17	33.60	88.50	2.63	105.10	485.48
Kuntola	0.25	12.80	51.20	9.05	19.45	2.15	48.57	299.42
Lower Kuthlad	18.41	540.50	29.36	1.10	3.35	3.05	3.40	25.20
Birganga	6.90	205.30	29.75	14.10	74.71	5.30	40.31	175.15
Ladoligad	12.95	406.20	31.37	23.73	181.00	7.63	51.21	902.12
Dhamarigad	-	-	-	30.85	529.25	17.16	15.80	1467.35
Debligad	54.45	5081.50	93.32	9.85	2.21	0.22	46.52	426.33
Bhatnalagad	2.00	2.00	1.00	-	-	-	865.45	1537.65@
TOTAL	96.76	6255.80	64.65	122.28	898.47	7.35	1146.36	5318.70

forests, which are under the control of the Forest Departments, for meeting their needs of fuelwood, fodder and timber. Hence in the present situation, the distance from reserved forests would have a major impact on the energy problems faced by the rural households, especially in terms of the time and efforts they have to put in to collect their fuelwood needs.

II. Population and its Characteristics

Tables 2.2 and 2.3 give details of the population of the selected villaged clusters, its break-up by sex and caste and the level of literacy. It will be seen that the number of households (the primary unit of sampling) ranges between 235 and 260 giving an overall average of 250.5 in all the eight clusters combined. This is, in fact, what we aimed at-to select clusters of villages in order to get a total of about 250 households which were surveyed on a census basis. The population of the clusters ranges between 1360 and 1795, with an average of 1509.5 per cluster. A notable feature of the population is that males outnumber females in all clusters except one (Dhanarigad). In seven of the eight clusters the ratio of females per 1000 males ranges between 748 and 917, whereas in Dhanarigad it is 1072. For all the clusters combined this ratio comes to 856. This is in sharp contrast to the general situation prevailing in the hill district of U.P. where, according to the census data, females

outnumber males in all but three districts viz. Dehradun, Nainital and Uttarkashi. The main reason for this is the high level of male outmigration in search ofjobs. Thus according to the 1981 census data the sex ration in Uttara-Khand was 959 females per 1000 males, which is higher than the overall state average of 885 and much higher than what our data show. This only shows that probably the villages we have selected for study have not witnessed as high a degree of male outmigration as is generally prevalent in the area.

The data on caste composition of households shows that overall about 70 per cent belong to the upper castes (Brahmans and Thakurs) and about 28 per cent to the Scheduled Castes. The Thakurs tend to be the dominent caste with 46 per cent of the households coming from that category-in all the clusters combined. They are also dominent in four of the eight clusters, while the Brahmans are dominant in two clusters and the Scheduled Castes in one. In one cluster (Lower Kuthlad) all the three major caste groups are more or less evenly represented, with the Thakurs having a slight edge followed by the Brahmans and scheduled castes. Finally, in the Birganga (Chamoli District) cluster we also find a significant number of scheduled Tribe households (Bhotiyas) Their number is 23 which constitutes about 9 per cent of the household in this cluster. In all the other cluster,over

99 per cent of the households belong to the three major caste groups: Brahmins, Thakurs and Scheduled Castes, which is quite in conformity with the caste composition of the population in Uttarakhand generally.

An interesting feature of the data in Table 2.2 and 2.3 is the high level of literacy, especially among the males. In all the eight clusters combined the percentage of literates in the total population comes to 36.44 with 50.22 per cent of the males and 20.36 per cent of the females being literate. In individual clusters the general literacy percentage ranges between 14 (Bhatnalagad) and 60 (Ladoligad). The percentage of male and female literacy, on the other hand ranges between 20 and 77 and 5 and 40 respectively. Prima Facie, it would appear that the level of literacy in general and of female literacy in particular tends to be higher in those village clusters which have a favourable location and vice versa. Thus all the 4 clusters where overall literacy is less than 35 per cent and female literacy less than 10 per cent are the relatively isolated ones as pointed out in the previous section. Similarly, clusters with an overall literacy rate of more than 45 per cent and female literacy over 30 per cent are the more favourable located ones. Male literacy does not seem to be as clearly related to locational factors, except perhaps in two clusters - Bhatnalagad and Debligad- as female literacy.

Table 2.2

General Characteristics of the Households and Population

Village clusters	No.of house-holds	Population			Caste of households				No.of literates		
		Total	Male	Female	Brah-mins	Thakurs	S.C.	Others	Total	Male	Female
Naukuchiyatal	235	1360	778	582	141	39	53	2	697	474	223
Kuntola	251	1543	843	700	3	121	127	-	509	448	61
Lower Kuthlad	248	1616	843	773	81	91	72	4	746	486	260
Birganga	252	1473	788	685	36	113	80	23*	697	494	203
Ladoligad	254	1431	771	660	59	179	15	1	858	596	262
Dhanarigad	250	1430	690	740	119	36	95	-	364	326	38
Debligad	260	1428	767	661	7	216	37	-	286	239	47
Bhatnalagad	254	1795	1026	769	32	136	86	-	244	204	40
TOTAL	2004	12076	6506	5570	478	931	565	30	4401	3267	1134

* Mostly Scheduled Tribes.

Table 2.3

Percentage Distribution of Households by Caste and Literacy

Village clusters	Caste of Households (%)				% Literacy		
	Brahmin	Thakur	S.C.	Others	Male	Female	Total
Naukuchiyatal	60.00	16.60	22.55	0.85	60.93	38.32	51.25
Kuntola	1.20	48.21	50.60	-	53.14	8.71	32.99
Lower Kuthlad	32.66	36.69	29.03	1.61	57.65	33.64	46.16
Birganga	14.29	44.84	31.75	9.13	62.69	29.64	47.32
Ladoligad	23.23	70.47	5.91	0.39	77.30	39.70	59.96
Dhanarigad	47.60	14.40	38.00	-	47.25	5114	25.45
Debligad	2.69	83.08	14.23	-	31.16	7.11	20.03
Bhatnalagad	12.60	53.54	33.86	-	19.88	5.20	13.59
TOTAL	23.85	46.46	28.19	1.50	50.22	20.36	36.44

Table 2.4

Main Sources of Household Income

Village cluster	Cultivation	Ag.Labour	Non-Ag. Labour	Service	Business	Other	All Activities
Naukuchiyatal	189 (80.43)	13 (5.53)	10 (4.26)	19 (8.08)	3 (1.28)	1 (0.43)	235 (100.00)
Kuntola	217 (86.45)	16 (6.37)	7 (2.79)	10 (3.98)	1 (0.40)	-	251 (100.00
Lower Kuthlad	215 (86-69)	11 (4.44)	6 (2.42)	15 (6.05)	-	1 (0.40)	248 (100.00)
Birganga	220 (87.30)	3 (1.19)	-	17 (6.75)	6 (2.38)	6 (2.38)	252 (100.00)
Ladoligad	247 (97.24)	-	-	7 (2.76)	-	-	254 (100.00
Dhanarigad	238 (95.20)	1 (0.40)	2 (0.80)	9 (3.60)	-	-	250 (100.00)
Debligad	257 (98.85)	2 (0.77)	-	1 (0.38)	-	-	260 (100.00)
Bhatnalagad	250 (98.43)	-	-	-	2 (0.79)	2 (0.79)	254 (100.00)
TOTAL	1833 (91.47)	46 (2.30)	25 (1.25)	78 (3.89)	12 (0.60)	10 (0.50)	2004 (100.00

Figures in Parentheses represent percentages

*Includes traditional trades and services

Table 2.5

Secondary sources of Household Income :

Village cluster	Cultivation	Agr.Labour	Non-Agr. Labour	Service	Business	Others*	Total reporting	% reporting
Naukuchiyatal	1 (0.57)	39 (22.29)	49 (28.00)	67 (38.29)	19 (10.86)	- -	175 (100.00)	74.47
Kuntola	- -	48 (21.33)	73 (32.44)	76 (33.78	16 (7.11)	12 (5.33)	225 (100.00)	89.64
Lower Kuthlad	- -	16 (8.38)	36 (18.85)	122 (63.87)	11 (5.76)	6 (3.14)	191 (100.00)	77.02
Birganga	- -	1 (0.47)	66 (31.28)	102 (48.34)	12 (5.69)	30 (14.22)	211 (100.00)	83.73
Ladoligad	- -	6 (2.69)	15 (6.73)	167 (74.89)	7 (3.14)	28 (12.56)	223 (100.00)	87.80
Dhanarigad	- -	1 (0.72)	66 (47.83)	63 (45.65)	4 (2.90)	4 (2.90)	138 (100.00)	55.20
Debligad	- -	5 (6.58)	28 (36.84)	24 (31.58)	7 (9.21)	7 (9.21)	76 (100.00)	29.23
Bhatnalagad	- -	1 (2.86)	- -	19 (54.29)	15 (42.86)	15 (42.86)	35 (100.00)	13.78
	1 (0.08)	117 (9.18)	333 (26.14)	640 (50.24)	81 (6.36)	102 (8.01)	1274 (100.00)	63.57

Figures in parentheses represent percentages.

* Includes traditional trades and services.

In general, however, the data do show quite a high level of literacy in Uttarakhand. This is confirmed by the census data as well. According to the 1981 Census the general literacy percentage in Uttarakhand was 39.29. Male and female literacy rates were 53.85 and 24.11 per cent respectively. As against this the figures for the entire state of U.P. were: 27.16 per cent general literacy, 38.76 per cent male literacy and 14.04 per cent female literacy. In case we take only the rural population into consideration, then we find that according to the 1981 census 34.38 per cent of the population was literate. The percentage of male and female literates was 50.07 and 18.83 respectively. Our figures for the eight clusters are pretty much in confirmity with the overall pattern in rural Uttarakhand. In U.P. as whole only 23.09 per cent of the rural population was literate while the literacy rates for rural males and rural females was 35.18 per cent and 9.94 per cent respectively. Thus both male and female literacy rates in Uttarakhand are much higher than the state average. A major reason for this is that a large part of development expenditure in Uttarakhand in recent years has

been spent on social services, especially education (Sanwal 1983). As a result the region is well served by educational institutions as can be seen from the following figures. In 1983 the number of junior Basic, Senior Basic and Higher Secondary Schools per lakh of population came to 146.02, 26.68 and 15.20 respectively in Uttarakhand as against the state average of 65.41, 12.61 and 5.10 respectively (U.P. Draft Seventh Five Year Plan, 1985, p.204).

III. Household Economic Structure

In this section we will briefly review the structure of economic activities at the household level as revealed by our survey data. It will be seen from Table 2.4 that agriculture is the single most important source of livelihood in all the eight village clusters. Over 93 per cent of the households have reported agriculture to be their main source of income. In individual clusters the percentage of household dependent mainly on agriculture varies between 86 (Naukuchiyatal) and almost 100 (Debligad). Furthermore, the bulk of the households who are dependent on agriculture as the primary means of livlihood are cultivators while only a small proportion are agricultural labourers. Cultivators constitute about 91 per cent of the households in all the clusters. In individual clusters their percentage ranges between 80 & 99. Agricultural labourers, on the other hand, account for

only two per cent of all households. In only three clusters (Lower Kuthlad, Naukuchiyatal and Kuntola) is their percentage over 4 per cent the maximum being 6 per cent in Kuntola. As noted in Chapter I this is in conformity with the general pattern prevailing in Uttarakhand.

Outside of agriculture, the next importing source of livelihood for people in Uttarakhand is service. About 4 per cent of households in all the eight clusters are mainly dependent on this source. Furthermore, households dependent on service for their livelihood are to be found in all clusters except one (Bhatnalagad). The proportion of such households in individual clusters ranges between 0.4 per cent and 8 per cent. The other non-agricultural source of household income like non-agricultural labour and business etc. provide sustenance to only a few households. Slightly over 3 per cent of the households depends on these sources in all the eight clusters. Moreover, in only four of the eight clusters viz. Naukuchiyatal, Kuntola, Lower Kuthlad and Birganga do we find more than two per cent of the house holds deriving their sustances from these sources.with the largest proportion (about 6 per cent) being in Naukuchiyatal. We thus find that the economy at the household level is predominantly agrarian in all the eight clusters. At the same time we also find a somewhat greater diversification of economic activities in Naukuchiyatal and Birganga as

compared to the other clusters.

Table 2.5, however, shows that even though agriculture is the main source of livelihood for an overwhelming proportion of the households, it is not perhaps able to meet all their requirements so that they have to supplement their income from secondary sources. Thus about 64 per cent of the households have reported secondary sources of income in all the eight clusters combines. In individual clusters the percentage of households reporting secondary sources of income ranges from a low of a out 14 per cent (Bhatnalagad) to a high of about 90 per cent (Kuntola). In infact in five clusters 75 per cent or more households report secondary sources of income, in one about 55 per cent report such income while in two clusters the percentage of such households is less than 30. It is interesting to note that the three clusters where the percentage of households reporting secondary sources of income is less than the average for all the eight clusters, are all relatively remote in terms of distance from key facilities, especially metalled road. The only exception to this rule seems to be Kuntola which is also situated at some distance from a metal road but where almost 90 per cent of the households have reported secondary sources of income. What this suggests, therefore, is that the proportion of households going in for secondary sources of income is perhaps related more to the availability of opportunities than to either the need of the households or the ability of agri-

culture to meet their basic needs. As we will see later, agriculture is by and large of the subsistance type and in the case of most of the households it can at best meet a few months requirements of foodgrains. For the rest, they have to depend on purchases from the market for which they need other sources of income.

As far as the secondary sources of household income are concerned we find that the maximum number of households (over 50 per cent) are engaged in service, mainly petty jobs in the Government. This is the single most important secondary source of employment in all but two of the clusters. Next in importance is non-agricultural labour which is the most important source of secondary income in two clusters and has a substantial share - 19 per cent or more- in 4 others. Overall over 26 per cent of the reporting households are engaged in this activity for supplementing their household income. Third and fourth places in order of importance are occupied by agricultural labour, which has a significant representation in only two clusters and other occupations- mainly traditional trades, crafts and services- which is important as a secondary source of livelihood in three clusters. In Bhatnalagad over 43 per cent of the reporting household supplement their income through this source. In all clusters combined 9 and 8 per cent of the reporting household respectively depend on agricultural labour and other avtivities for supplementing their income. Finally

we find that only 6 per cent of the reporting household are dependent on business and trade, mainly in the form of petty shopkeeping, for supplementing their income.

In the end it would be relevant to point out that while cultivation is the primary source of livelihood for an over whelming majority of the households in all the clusters, it hardly figures as a secondary source except in the case of one household. What this suggests is that though the vast majority of the rural population is dependent on agriculture, it is not able to meet its minimum needs. They have to look for other supplementary avenues for making ends meet. This will become clearer when we take a closer look at the state of the agricultural economy a little later. Before that, however, it may be worthwhile to analyse the pattern of land ownership as that, to a large extent, would determine the nature of agriculture.

Pattern of Land Ownership

It is generally known that in Uttarakhand there is a predominance of small holdings which, moreover, are scattered in small plots and terraced fields-often of handkerchief size. Combined with the fact that only 13 per cent of the area is under cultivation the result is that the land base for agriculture is very small. Hence for most of the cultivating households, agriculture is by and large a subsistence activity.

The pattern of land ownership in the eight clusters selected by us is given in Table 2.6. It will be seen that there is a predominance of small and marginal holdings in all the clusters except one (Bhatnalagad). In all the eight clusters taken together about 93 per cent of the households own less than 5 acres each while the area of such holdings is about 68 per cent. Over 21 per cent of household own less than 0.5 acres each and over 48 per cent own less than 1 acre. The area of holdings below 1 acre is about 16 per cent of all land owned. Twenty six per cent of the households fall in the size class 1-1,99 acres accounting for 22 per cent of the area, and about 15 per cent own between 2 and 4.99 acres with a total holding of about 30 per cent of the land. Households owning more than 5 acres are relatively few-only 7 per cent-though they control almost one-third of the total land. The average size of family holdings in all the eight clusters taken together is about 1.5 acres.

Coming to individual clusters, we notice that in only one of them viz. Bhatnalagad, is there a predominance of larger holdings as compared to the smaller ones. Here, over 47 per cent of the households own more than 5 acres and their total holdings account for about 71 per cent of the land owned. In contrast only 8 per cent of the households own less than one acre and the area of such holdings is less than one per cent of the land owned. The percentage of households owning morethan 2 acres is over 80 accounting

for over 95 per cent of the total land. As a result, the average size of family holdings, 4.3 acres, is also much larger than the average for all the clusters. In all the other clusters between 97.7 to 100 per cent of the households own less than 5 acres and the area of such holdings is over 86 per cent of the total land owned in all clusters except one. The exception is Birganga where the land holding class of 5 acres and more accounts for about 24 per cent of the total land. On the other hand, in three clusters, viz. Ladoligad, Kuntola and Dhanarigad the bulk of the households and the land owned by them fall in the lower land holdings class. Thus in Ladoligad none of the households own 5 acres or more. In Kuntola only 0.4 per cent of the households fall in this category accounting for 3.33 per cent of the land. Similarly in Dbaharigad the percentage of households owning more than 5 acres is only 1.6 while the area owned by them is about 6 per cent of the total. In Kuntola the next lower land holding class i.e. 2 to 4.99 acres also has only 1.2 per cent of the households with a total share of 4.3 per cent of the land. We thus find that in Kuntola 98 per cent of the households own less than 2 acres each and the holdings of this category constitute 92 per cent of the total land.

Furthermore, we notice that in all clusters, except Bhatnalagad between 75 per cent and 98 per cent of the households own less than 2 acres and the area of such holdings

Table 2.6

Percentage Distribution of Households by Land Holding Size

Land Holding Size Class (Acres)	VILLAGE CLUSTERS							
	Naukuchiya tal		Kuntola		Lower Kuthlad		Birganga	
	%of H.H.	%of Area	%of H.H.	%of Area	%of H.H.	%of Area	%of H.H.	%of Area
Landless	3.83	-	6.37	-	7.26	-	6.35	-
Less than 0.5	31.06	7.00	36.25	16.45	25.40	5.70	27.78	6.19
0.5-0.99	27.66	14.39	40.24	44.76	27.42	18.62	29.37	16.72
1.00-1.99	23.83	25.34	15.54	31.13	27.82	34.89	19.84	22.50
2.00-4.99	12.34	39.86	1.20	4.33	11.69	30.68	15.48	30.79
5 and above	1.28	13.41	0.40	3.33	0.40	10.10	1.19	23.72
All classes	100	100	100	100	100	100	100	100
Average size of holdings(Acres)	1.11		0.60		1.00		1.18	
Gini Coeff.	0.549		0.359		0.489		0.552	

Table 2.6 (Contd.)

Land Holding size Class (Acres)	VILLAGE CLUSTERS									
	Ladoligad		Dharigad		Debligad		Bhatnala		Others	
	%of H.H.	%of Area	%of H.H.	%of Area	%of H.H.	%of Area	%of H.H.	%of Area	%of H.H.	%of Area
Landless	1.97	-	0.40	-	1.54	-	0.39	-	3.49	-
Less than 0.5	5.51	1.48	20.00	3.64	23.46	5.67	1.18	0.06	21.21	3.68
0.5-0.99	31.89	18.63	16.80	7.54	38.00	22.17	6.30	0.75	27.75	11.94
1.00-1.99	47.24	51.06	38.00	36.81	21.92	26.86	11.42	3.40	25.70	22.20
2.00-4.99	13.39	28.82	23.20	16.17	12.69	31.98	33.46	24.88	15.47	29.77
5 and above	-	-	1.60	5.84	2.31	13.31	47.24	70.91	6.89	32.40
All Classes	100	100	100	100	100	100	100	100	100	100
Average size of holdings(Acre)	1.18	1.18	1.35	1.37	1.15		4.29		1.49	
Gini Coeff.	0.270		0.382		0.456		0.272		0.524	

varies between 45 per cent and 92 per cent of the total land owned. In 4 of these clusters viz. Kuntola, Lower Kuthlad, Ladoligad and Dhanarigad the area under holdings of less than 2 acres is morethan 50 per cent of the total area. Thus overall there is a predominance of small holdings in all the clusters except one. The average size of holdings ranges between 0.6 acres and 1.4 acres in these seven clusters.

Finally, it may be noted that the degree of inequality in the ownership of land as measured by the Gini Coefficient is not very high. For all the clusters combined it comes to 0.524. The situation in individual clusters is as follows :

Clusters	Value of Gini Coeff
Ladoligad & Bhatnalagad	0.270 & 0.272
Kuntola & Dhanarigad	0.359 & 0.382
Naukuchiyatal & Birganga	0.549 & 0.552
Debligad & Lower Kuthlad	0.456 & 0.489

Thus in four clusters the degree of ineuqquality is on the low side while in the remaining four it is moderate.

While on the subject of land, which as we have tried to emphasis, is the basic resource for the bulk of the population in our sample it would also be relevant to take a look at the extent of irrigation on which the productivity of land ultimately depends. Table 2.7 below gives an idea of the extent of irrigation in the different clusters. It will be seen that in all the eight clusters combined the

percentage of irrigated area comes to about 17. This figure lies in-between the figure of 29 per cent for the eight districts of Uttarakhand and 10 per cent for the six predominantly hilldistricts (excluding Dehra Dun and Naini Tal) which we noted in Chapter I. In individual clusters the extent of irrigated area varies from a low of 0.6 per cent (Bhatnalagad) to a high of 48 per cent (Dhanarigad). Apart from Bhatnalagad, where the irrigated area is almost non-existent, the extent of irrigation is also very low in two other clusters i.e., Birganga where it is about 5 per cent and Ladoligad where it is about 11 per cent. In Naukuchiyatal (20 per cent) Debligad (30 per cent) and Kuntola (34 per cent) it is fairly good especially in comparision to the situation prevailing in the hilly parts of Uttarakhand. In Lower Kuthlad (41 per cent) and Dhanarigad (48 per cent), however, the irrigated area is fairly extensive.

As far as the availability of irrigation is concerned it needs to be pointed out that it is related to location. Villages located close to rivers and perennial streams have, in general, better irrigation coverage than those which are upland and at some distance from such sources. The main source of irrigation in Uttarakhand are rivers and perennial streams which are harnessed by constructing small gravity channels called Guls.

Table 2.7

Extent of Area Irrigated

(Area in acres)

Village Cluster	Total Land Owned	Irrigated Area	%of area Irrigated
Naukuchiyatal	261.02	51.30	19.65
Kuntola	150.03	50.47	33.64
Lower Kuthlad	247.52	100.50	40.60
Birganga	297.61	14.17	4.76
Ladoligad	300.61	32.50	10.81
Dhanarigad	342.30	164.00	47.91
Debligad	300.07	89.96	29.98
Bhatnalagad	1090.04	6.83	0.63
TOTAL :	2989.20	509.73	73.05

Agricultural Production :

We have already seen that agriculture provides the mainstay for the bulk of the population in all the eight clusters we have selected for study. At the same time agriculture is beset with a number of problems, the most important of which are the predominance of small and marginal holdings and the lack of irrigation facilities. In addition we also find that the soils in the hill areas, especially in upland areas, are rather poor-being shallow, poor-textured and stony. It is, therefore, important to see what impact this has on agricultural production and ultimately on the

living conditions of the population.

The main crops grown in the region are Paddy, Mandua, Maize, Pulses (mainly Urd and Moong) and Millets during Kharif and Wheat, Barley and Pulses (mainly Masoor) during Rabi. The main cash crop is potato. The cropping cycle usually followed is Paddy-Wheat-Mandua-Fallow giving three crops in two years.

Details of agricultural production are given in Table 2.8. It will be seen that paddy is the most important crop in the region in terms of production, though wheat occupies the largest area. In all the eight clusters the area under paddy was about 921 acres and under wheat 1478 acres. The production of paddy came to about 10130 quintals and of wheat to 8004 quintals. Paddy and Wheat are grown in all the clusters. In only two of the eight clusters is the production of wheat higher than that of paddy, although in 4 clusters the area under wheat is greater than the area under paddy.

The yield of Paddy was also uniformly higher than that of wheat in all the eight clusters. The reason for this could be the fact that in the hill areas paddy is generally grown in irrigated fields and also during a time of the year when rains are plentiful. Wheat on the other hand is generally grown in rain-fed conditions. Thus it will be seen that clusters which show a high yield of both paddy

and wheat also have more area underirrigation that the rest. The only exceptions are Kuntola and Nukuchiyatal where the area irrigated is higher than the average for all the clusters while the yields of wheat and paddy are considerably lower. The explanation for this may perhaps lie in the failure of rains-both during the monsoons and the winter-in these areas during 1984-85 when the data were collected. At least this was the widespread feeling among the households as reported by them during the time of investigations.

After paddy and wheat the next most important crop in Uttarakhand is Mandua (ragi). It was grown in all but one of the clusters. There is considerable variation in the yield of mandua, and no clear relationship between extent of irrigation and yields can be discerned. One reason for this could be that mandua is normally grown under rainfed conditions and is not an irrigated crop. In general it will be noticed that the area, production and yield of mandua were higher in Garhwal than in Kumaon. Apart from paddy, wheat and mandua, the other cereals grown in the area are barley and maize. Maize is an important crop in Bhatnalagad and in fact happens to be the main foodgrains crop apart from mandua. The predominance of coarse cereals in the cropping patternsof Bhatnalagad can be explained largely in terms of the virtual absence of irrigation facilities-less than one per cent of the land is irrigated.

Pulses are grown in all village clusters except Bhatnalagad. However, in terms of total production they appear to be a minor crop, except perhaps in Dhanarigad where the production and yields of pulses are both significantly higher than in the other clusters. In fact Table 2.8 shows that this is the case in respect of all the major crops. Obviously, the fact that about 48 per cent of the area is irrigated in this cluster has a lot to do with its superior performance in the field of agriculture.

The main cash crop in Uttarakhand is potato. It was grown in 6 of the eight clusters. However, it will be seen that in only four of them does it constitute a major crop, while in one Debligad-it turns out to be the most important crop in terms of production. This last cluster appears to be especially suited to the production of potatos as is evident from the yield which is almost 5 times that of the other three clusters where it is an important crop.

Data on the sale of agricultural produce (Table 2.9) show that the major part of the production is consumed by the households and only a small part is sold. In two clusters, Naukuchiyatal and Kuntola, there was no sale of any produce. In Ladoligad and Debligad, only potatos and vegetables (included in the category 'others') were sold. In Bhatnalagad, on the other hand, the main items sold were

vegetables and some maize (both included in the category 'other'). The quantity of wheat and potatoes sold was so small that for all practical purposes it can be disregarded. Thus it will be seen that most of the sale of agricultural produce was accounted for by three clusters- Dhanarigad, Lower Kuthlad and Birganga. Of these the first two are again more important than the third. These two clusters also happen to be the ones where more than 40 per cent of the area is irrigated. Moreover, between 70 to almost 100 per cent of mandua, wheat, paddy and pulses sold was accounted for by Dhanarigad.

Tht total quantity of foodgrains sold, however, represents only a very small part of the production. In all the eight clusters combined only 2 per cent of the wheat, 1.5 per cent of paddy, 1.4 per cent of mandua and about 7 per cent of pulses were sold. Even in Dhanarigad, which accounted for the major portion of the produce sold, the percentage of cereals sold varied between 2.6 and 4.1 for different crops while about 12 per cent of the pulses produced were sold. The number of households reporting sale of agricultural produce is also low. Except in the case of potatoes and vegetables, less than one per cent of the households in all the clusters combined have reported sale of agricultural produce. Even in Dhanarigad where the largest number of households have reported sa le, the percentage of

such households does not exceed 4 in the case of any foodgrains crop. Thus it is clear that in all the clusters agriculture, which is the main source of livelihood of the people, is essentially a subsistance activity.

The only crop grown mainly for the market is potato and to some extent vegetables (included in the category others). Thus we find that in the clusters reporting sale of potatoes between 30 and 97 per cent of the production was sold. The maximum quantity was sold in Debligad which, we saw, was also the major producer of the crop. Overall about 85 per cent of the potatoes grown were sold.

Horticulture

While agriculture provides basic subsistence to the households, many of them derive supplementary income from the cultivation of fruits. The Uttarakhand region is climatically suited to the cultivation of temperate fruits like apples, pears, peaches, plums etc. and it is presumed that considerable potential for horticultural development exists in this area. In addition we also found that some tropical fruits like mango , are also grown in some parts of the region like Lower Kuthlad. The mangoes of Lower Kuthlad command a good market in Ramnagar, Moradabad and Delhi as they are ideally suited for purposes of pickling. Thus large quantities are transported for sale in these centres every year.

Table 2.9

Sale of Agricultural Produce

(Quantity in Quintals)

Village clusters	Wheat	Paddy	Mandua	Potato	Pulses	Others
Naukuchiya tal Qty.	-	-	-	-	-	-
No. of H.H.	-	-	-	-	-	-
Kuntola Qty.	-	-	-	-	-	-
No. of H.H.	-	-	-	-	-	-
Lower Kuthlad Qty.	27 (2.60)	37 (2.63)	9 (3.68)	241.5 (44.68)	0.79 (20.83)	-
No. of H.H.	5 (2.17)	5 (2.17)	4 (1.94)	33 (14.34)	1 (0.43)	-
Birganga Qty.	12 (1.78)	2 (0.17)	10 (2.12)	199 (96.93)	-	-
No. of H.H.	1 (0.42)	1 (0.42)	1 (0.42)	16 (6.77)	-	-
Ladoligad Qty.	-	-	-	124 (30.53)	-	60 (6.65)
No. of H.H.	-	-	-	6 (2.40)	-	6 (2.40)
Dhanarigad Qty.	125 (4.13)	109 (2.60)	35 (2.75)	-	62 (11.71)	791 (53.91)
No. of H.H.	10 (4.01)	9 (3.61)	5 (2.01)	-	3 (1.20)	55 (22.09)
Debligad Qty.	-	-	-	4706 (92.61)	-	217 (50.98)
	-	-	-		-	
	-	-	-	211 (83.07)	-	66 (25.98)
	-	-	-		-	
Bhatnalagad Qty.	2 (0.54)	-	-	1 (50.00)	-	56 (3.63)
	-	-	-		-	
No. of H.H.	1 (0.40)	-	-	1 (0.40)	-	23 (9.09)
	-	-	-		-	
TOTAL Qty.	166 (2.07)	148 (1.46)	54 (1.35)	5271.5 (84.27)	62.7 (6.98)	1124 (21.14)
No. of H.H.	17 (0.87)	15 (0.78)	10 (0.52)	266 (13.75)	4 (0.21)	150 (7.76)

Figures in brackets represent percentages : (a) in the case of quantity of total production and (b) in the case of households of all landowning households.

Table 2.10 gives an idea of the production and sale of important fruits and the net incom (excluding costs) from this activity. It will be seen that while some quantities of fruits are grown and sold in all the clusters, yet only in four of them can horticulture be considered of some economic significance. These clusters are Naukuchiyatal, Lower Kuthlad, Birganga and Debligad. In Naukuchiyatal and Debligad the main produce is temperate fruits like apples, pears, plums and peaches etc., while in Lower Kuthlad the production of other fruits (mainly mango) is predominant. In the fourth cluster-Birganga-both temperate and other fruits are produced, but the production and sale of the latter category is almost three times that of the former. The number of families deriving income from horticulture is highest in Lower Kuthlad where it is 139 which constitutes 56 per cent of all the households studied in that cluster. In the other 3 clusters the number of such families are relatively low-varying between 38 and 58 and they constitute 15 (Birganga and Debligad) and 25 (Naukuchiyatal) per cent of the total household in these clusters. The reason for the relatively higher number of lower Kuthlad is that most of the households have a few mango trees growing on their lands which gives them a source of income, without much effort. Mangoes are not grown in orchards in this area as is the case with temperate fruits in the other 3 clusters. In fact the data in Table 2.10

2.10

Production and Sale of Horticultural Produce

Village Cluster	No.of H.H.	Temperate Fruits		Other Fruits (incl.Mangoes)		Total Net Income(Rs)
		Production (Qtls)	Sale (QTls)	Production (Qtls)	Sale (Qtls)	
Naukuchiya Tal	58	699.00	645.00	8.00	6.00	60871
Kuntola	1	1.00	0.50	-	-	50
Lower Kuthlad	139	24.90	17.80	305.19	230.85	47535
Birganga	38	225.70	218.15	685.85	629.49	13298
Ladoligad	37	5.00	-	12.59	3.50	190
Dharigad	12	3.52	1.79	2.88	1.85	335
Debligad	39	698.20	607.30	6.00	3.00	32834
Bhatnalagad	1	N.A.	N.A.	N.A.	N.A.	3700
TOTAL	358	1657.32	1490.54	1020.51	874.69	158813

which show some production and sale of fruits in all the clusters largely reflects the production from isolated fruit trees growing on private land than from regular orchards as such, except perhsps in Naukuchiyatal, Debligad and to some extent in Birganga. The income per reporting household from horticulture is however not very large as Table 2.11 shows.

Table 2.11

Income Horticulture in Selected Clusters

Cluster	Income per reporting household (Rs./year)
Naukuchiyatal	1049.50
Lower Kuthlad	341.98
Birganga	349.95
Debligad	841.90

In two clusters-Lower Kuthlad and Birganga - it was in the region of Rs.340 - Rs.350 per household while in the other two-Debligad and Naukuchiyatal-it was around Rs.840-Rs.1050 per household. Thus horticulture at present is, at best, a small supplement to household income in Uttarakhand rather than a major source of livelihood for the rural households.

ANIMAL HUSBANDRY

Animal Husbandry, especially sale of milk and milk products, is another source os supplementary income in the rural areas of Uttarakhand. It would appear from the number of animals in the different clusters (Table 2.12) that the income from this activity should be considerable. However, this is not necessarily the case. The main produce from animal husbandry is milk and milk products as the bovine species are the most predominant ones in all the eight clusters. The milk yields of the cattle, however, are very low mainly for two reasons. Firstly, most of them are of indifferent breed and secondly, there is a serious shortage of fodder in most of the areas. The animals are usually left to graze on the hill sides as the practice of stall-feeding has not developed due to non-availability of fodder all through the year. Thus it is quite common to find cows yielding 0.5 to 1 litre of milk per day and buffaloes giving 2 to 3 litres per day. Thus in relation to the population of milch animals the production and sale of milk and milk products arequite low.

Table 2.13 gives an idea of the income from animal husbandry in the different clusters. It will be seen that the number of households reporting sale of milk and milk products was highest in Ladoligad (82), followed by Dhanarigad (48), Naukuchiyatal (42), Bhatnalagad (34) and Birganga (28). Only a few households were found to be selling these products in Debligad (16), Lower Kuthlad (7) and

Kuntola (only one). The quantity sold, as reflected in the value of sale was also higherst in Ladoligad followed by

Table 2.12

Number of Animals in the Selected Clusters

Village Cluster	Cows	Buffalos	Bullocks	Goats	Sheep	Mules	Pigs	Poultry
Naukuchiya tal	378	165	261	88	-	-	-	-
Kuntola	174	260	297	456	3	-	-	4
Lower Kuthlad	179	180	269	86	3	17	-	-
Birganga	555	181	384	231	68	14	-	8
Ladoligad	445	270	315	630	138	1	1	31
Dhanarigad	186	198	298	270	170	12	-	16
Debligad	525	302	452	383	145	11	-	68
Bhatnalagad	305	304	574	941	552	13	120	507
TOTAL	2747	1860	2850	3083	1079	68	121	634

Birganga, Naukuchiyatal, Dhanarigad and Debligad. In the other three clusters the quantity of these products sold was very small. This shows that sale of milk and milk products is valso related to the proximity of markets and consumers. In general sale was high in those clusters where towns or market centres were available in close proximity.

The returns from sale of milk and milk products to

Table 2.13

66

Village Cluster	No.of HH report-ing Sale	Value of sale(Rs)	Value of sale per HH sell-ing(Rs)	No.of H.H. report-ing sale	Value of sale (Rs)	Value of sale per HH sell-ing(Rs)
Naukuchiyatal	42	92408	2200	4	1756	439
Kuntola	1	1620	1620	2	350	175
Lower Kuthlad	7	17010	2430	-	-	-
Birganga	28	116010	3034	3	2250	750
Ladoligad	82	189600	2312	30	40255	1342
Dhanarigad	48	74858	1560	17	6160	362
Debligad	16	58090	3631	5	580	116
Bhatnalagad	34	3915	115	24	9521	397
TOTAL	258	547661	2123	85	60872	716

the households engaged in this activity were however modest. In all the eight clusters combined the annual value of sale came to Rs.2123 per household reporting sale. As far as the individual clusters are concerned the annual value of sale per household was in the range of Rs.3600-Rs.4000 in two clusters (Birganga and Debligad), Rs.2200-Rs.2430 in three (Lower Kuthlad, Ladoligad and Naukuchiyatal), Rs.1560-Rs.1620 in two (Kuntola and Dhanarigad) and only Rs.115 in one (Bhatnalagad).

The income from sale of other animal products-mainly meat, eggs, wool etc. was reported in seven of the eight clusters and the number of households reporting such income was only 185 in all. The number ranged from 2 in Kuntola to 30 in Ladoligad. In four clusters the number of such households was 5 or less while in the remaining three it ranged between 17 and 30. Except in Ladoligad, the value of sale of other animal products was ra ther low. The per household values of the sale were also low, except in Ladoligad where it amounted to Rs.1342 per year. In the other seven clusters the value ranged between Rs.116 to Rs.750 per household per year. In all the eight clusters the annual value of sale of these products was Rs.716 per household which was about one-third that of milk and milk products.

At this point we would like to point out that animal husbandry appears to be a more paying proposition in Uttarakhand than horticulture. This is evident from the fact that though fewer households were involved in sale of milk and milk products the income from this activity was almost three-and-a-half times that of the income from horticulture. This, inspite of the fact that milk production in Uttarakhand is hampered by lowyields, poor breeds and shortage of fodder.

OTHER SOURCES OF FAMILY INCOME

As we have seen earlier, though agriculture is the mainstay for the vast majority of the rural households in

Table 2.14

Annual Household Income from Non-Agricultural Activities

Village clusters	Business/Trade			Service			Labour			Others*			
	No. of HH reporting	Total income (Rs.)	Income/HH (Rs.)	No. of HH reporting	Total income (Rs.)	Income/HH (Rs.)	No. of HH reporting	Total Income (Rs.)	Income/HH (Rs.)	No. of HH reporting	Total income (Rs.)	Income/HH (Rs.)	TOTAL INCOME (Rupees)
Naukuchiyatal	22	265700	12077	86	1120800	13033	111	776250	6993	1	31670	31670	2194420
Kuntola	17	15900	935	86	621630	7228	144	255430	1774	12	58940	4912	951900
Lower Kuthlad	11	53300	4845	137	1104320	8061	69	144410	2093	7	34400	1914	1336430
Birganga	18	219360	12187	119	1198780	110074	70	297720	4253	36	140444	3901	1856304
Ladoligad	7	45600	6514	174	1225480	7043	21	53000	2524	28	95000	3393	1419080
Dhanarigad	4	55220	13805	72	864770	12011	70	267840	3826	4	54050	13513	1241880
Debligad	12	127100	10592	25	175280	7011	35	100210	2863	7	190125	27161	592715
Bhatnalagad	2	83900	41950	19	133050	7003	1	2200	2200	17	130130	7655	349280
TOTAL	93	866080	9313	718	6444110	8975	521	1897060	3641	112	734759	6560	9942009

* Includes traditional trades, crafts and services, contracting and transport.

Uttarakhand, yet a large number of them do take resources to other activities as well, mainly as a source of cash earnings. It would therefore, be worthwhile to examine the importance of these activities in supplementing household incomes. The relevant data are presented in Table 2.14. It will be seen that the most important supplementary source of income in terms of numberof households engaged in it is service, followed by labour, traditional trades, crafts and services along with government contracts (included in others) and business. In all the eight clusters combined we find 718 households reporting income from service, 521 from labour 112 from other occupations and 93 from business, trade etc. In individual clusters there is some variation from this pattern. In 5 clusters - viz. Lower Kuthlad, Ladoligad, Birganga, Dhanarigad and Bhatnalagad maximum number of households are engaged in service as a supplementary source of income. In the remaining three viz Naukuchiyatal, Kuntola and Debligad the maximum number of households are engaged in labour with service coming second in importance. The other two sources of non-agricultural income generally come third and fourth in importance as far as number of households engaged in those activities is concerned, although their relative importance varies from cluster to cluster.

In general we find that in 6 of the 8 clusters a relatively large number of hous holds derive some income

from non-agricuktural activities. In Bhatnalagad and Debli-gad on the other hand, the number of such households in much fewer. It is also note-worthy that the clusters which have a relatively favourable location in terms of proximity to urban centres and roads also have a large number of house-holds deriving income from service and business. Thus location seems to have some impact on the availability of non-agricultural earning opportunities.

As far as the earnings from these activities are con-cerned, it will be seen that we have calculated per house-hold income from the different activities. This shows that in general the returns are highest from business and trade-Rs.9313 per household engaged in this activity, followed by service- Rs.8975 per household, and other activities - 6560 per household. Predictably the income is lowest in the case of labour- only Rs.3641 per household.

The data thus show that non-agricultural activities contribute a substantial amount to household income in the rural areas of Uttarakhand and, perhaps more importantly, a large number of rural household are able to derive some benefit from them.

REMITTANCES

We finally take up remittances as a source of cash income for the rural households of Uttarakhand. This is

generally considered an important ingredient of the cash income of the people in the region because the incidence of male out-migration is considerable. The popular view about the economy of the area is thus summed up in the expression "money-order economy".

Table 2.15 provides information on migration and remittances as revealed by our study of 2004 households spread over eight village clusters in the eight districts. It will be seen that out migration and receipt of remittances has been reported in all the eight clusters. Overall we find that one-third of all households report at least one member as having migrated. In individual clusters the percentage of households reporting migration varies from a low of 6.5 per cent to a high of about 67 per cent. In three clusters viz. Birganga, Lower Kuthlad and Ladoligad this percentage is quite high (Between 45 and 67), in three other viz. Naukuchiyatal Dhanarigad and Kuntola it is moderate (between 20 and 33), while in the remaining two Debligad and Bhatnalagad-it is rather low (about 6.5).

The remittances per household come to Rs.3568 in all the eight clusters combined. In individual clusters they range between Rs. 1341 (Debligad) and Rs, 4948 (Ladoligad). Thus, in brief, we can say that the households from which some male members have migrated do get some cash income through remittances-about Rs.300 per household per month on the average-

which is a net addition to the incomes of the households. Combined with the income from animal husbandry, horticulture and other sources-chiefly service, labour, business etc- which as we have seen is not inconsiderable, this would tend to make the life of the households receiving such income a bit more comfortable.

Table 2.15

Incidence of Migration and Quantum of Remittances

Village cluster	HH reporting Migration		Remittances receive(Rs)	
	No.	%	Total	Per HH
Naukuchiyatal	49	20.85	181800	3710
Kuntola	83	33.07	193840	2335
Lower Kuthlad	139	56.05	308500	2219
Birganga	114	45.24	447880	3929
Ladoligad	170	66.93	841130	4948
Dhanarigad	78	31.20	345300	4427
Debligad	17	6.54	22800	1341
Bhatnalagad	17	6.69	38800	2282
TOTAL	667	33.28	2380050	3568

IV. CONCLUSION:

To conclude this discussion of the socio-economic characteristics of the selected village clusters and the nature of the household economy we would like to point out that the village clusters selected by us are by and

large representative of thesituation prevailing in the rural areas of Uttarakhand in terms of important socio-economic characteristics. As far as location is concerned they represent different altitudinaland agro climatic zones in the area. Some clusters are relatively close to towns and urban centres and are connected to them by roads while others are more remote and isolated and few lie in between. Location, as we have seen has an important economic impact on the household economy as it seems to affect opportunities ofor non-agricultural sources of income and income from subsidiary activities like animal husbandry etc.

Agriculture is the main source of livelihood for over 90 per cent of the rural households. Yet, the overwhelming majority of the households tend to produce for home-consumption only. Less than two per cent of the production of major crops- wheat, paddy and mandua- was found to be marketed while the proportion of households reporting sale was even less-not even one percent. Both agricultural production and marketing of agricultural produce were closely related to the availability of irrigation. In clusters, where irrigation facilities were adequate both the level of production as well as quantity of agricultural produce marketed were higher than in the others. In general, however, only a small part of

the cultivated area-about 18 per cent-was found to be irrigated. The main cash crop was potato which was an important crop in only a few clusters.

The amajor bottleneck in agriculture, apart from lack of irrigation, appears to be the nature of land-holdings. There is a predominance of small and marginal holdings. Ninety three per cent of the holdings are less than 5 acres and about seventy eight per cent are less than 2 acres in size. Combined with the general lack of irrigation this tends to make agriculture largely a subsistance activity. The incidence of landlessness, however, is rather low as less than 4 per cent of the households own no land. The overall distribution of land ownership is also not very skewed.

Since agriculture can provide only basic subsistence a large number of the households have to take recourse to secondary sources of income. In our sample over 60 per cent of the households reported secondary sources of income. The main activities, in which the households are engaged for supplementing their income are, in order of importance, service, non-agricultural labour, agricultural labour, traditional trades and services, and business trading etc. The income from these sources is however substantial. Cash income is also provided to the rural households by horticulture, animal husbandry and remittances from those members of the

households who have migrated out. All in all, therefore, the cash income available to a large number of households from all these sources is considerable. Combined with the basic food security which agriculture provides, their economic condition is not too bad. Rather, it may be termed comfortable.

CHAPTER III

Pattern of Energy Consumption

In the previous chapter we analysed the general socio-economic characteristics of the village clusters and the nature of the household economy. We now take up a study of the energy consumption pattern at the household level. We have attempted first of all to identify the main sources of energy at the level of the households and the uses to which they are put. We then move on to estimate the quantities of the different sources consumed by the households. Finally we take up a discussion of the problems associated with availability of different energy sources.

At the household level energy is used almost exclusively forthree purposes - cooking, space heating and lighting. Tables 3.1 to 3.3 give the distribution of households according to sources of energy used for these purposes in the different village clusters.

Turning our attention first to cooking which accounts for the bulk of the domestic energy demand, we notice from Table 3.1 than an overwhelming majority of the households in all the eight clusters combined (99 per cent) depend on fuelwood. In individual clusters the percentage of households using fuelwood for cooking varies between 95 and 100. In five of the eight clusters all the households use fuelwood for cooking.

Table - 3.1

Distribution of Households According to Source of Energy used for Cooking

Village Cluster	Fuelwood	Ag.Waste	Charcoal	Kerosene	Saw Dust	LPG
Naukuchiya Tal	231 (98.30)	-	1 (0.43)	7 (2.99)	-	1 (0.43)
Kuntola	251 (100.00)	-	-	-	-	-
Lower Kuthlad	247 (99.60)	-	-	-	-	1 (0.40)
Birganga	250 (100.00)	-	-	-	-	-
Ladoligad	254 (100.00)	-	1 (0.39)	38 (14.96)	-	-
Dhanarigad	250 (100.00)	-	-	-		
Debligad	248 (95.34)	-	-	-	10 (3.85)	-
Bhatnalagad	254 (100.00)	6 (2.36)	-	-	-	-
TOTAL	1985 (99.05)	6 (0.30)	2 (0.10)	45 (2.25)	10 (0.50)	2 (0.10)

Table - 3.2

Distribution of Households According to Source of Energy Used for Space Heating

Village Cluster	Fuelwood	Ag.waste	Charcoal	Kerosene	Saw dust	Electricity
Naukuchiya Tal	230 (97.87)	-	1 (0.43)	2 (0.85)	-	1 (0.43)
Kuntola	251 (100.00)	-	-	-	-	-
Lower Kuthlad	247 (99.60)	-	-	-	-	-
Birganga	249 (98.81)	-	2 (0.79)	-	-	1 (0.40)
Ladoligad	254 (100.00)	-	-	-	-	-
Dhanarigad	235 (95.00)	-	-	-	-	-
Debligad	247 (95.00)	-	-	-	10 (3.85)	-
Bhatnalagad	253 (99.61)	5 (1.97)	-	-	-	-
TOTAL	1966 (98.10)	5 (0.25)	3 (0.15)	2 (0.10)	10 (0.50)	2 (0.10)

Table - 3.3

Distribution of Households According to Source of Energy used for Lighting.

Village Cluster	Kerosene	Electricity	Pine Sticks	Candles
Naukuchiya Tal	163 (69.36)	61 (25.96)	-	-
Kuntola	117 (46.61)	-	233 (92.83)	-
Lower Kuthlad	196 (79.03)	68 (27.42)	42 (16.94)	-
Birganga	220 (87.30)	63 (25.00)	(3.17)	-
Ladoligad	241 (84.88)	76 (29.92)	43 (16.93)	6 (2.36)
Dhanarigad	216 (86.40)	-	158 (63.20)	-
Debligad	207 (79.62)	60 (23.08)	16 (6.15)	-
Bhatnalagad	254 (100.00)	-	50	-
T O T A L	1614 (86.54)	328 (16.37)	550 (27.45)	6 (0.30)

In three of them viz., Kuntola, Birganga and Dhanarigad it is the only source of energy used for cooking, while in the other two it is supplemented by other energy sources : in Bhatnalagad by agricultural wastes and in Ladoligad by charcoal and kerosene. The number of households using agricultural wastes in Bhatnalagad and charcoal in Ladoligad is however very small- 6 and 1 respectively. A larger number - 38, constituting 15 per cent of the households in the cluster -reported the use of kerosene in addition to fuelwood. In two clusters, one household each was found to be using LPG for cooking, which indeed is quite rare and unusual in the rural areas of Uttarakhand. These clusters were Naukuchiya Tal and Lower Kuthlad. In Naukuchiya Tal moreover one household also reported the use of charcoal and 7 of kerosene. Finally we find that in Debligad 10 households were found to be using saw-dust for cooking.

One fact clearly emerging from Table 3.1 is that fuelwood is the single most important source of cooking energy. Unlike in the rest of the country cow-dung finds no place as a source of fuel. It is used almost exclusively as farmyard manure. There are a number of reasons for this. Firstly, even today the people of Uttarakhand have access to forests for meeting their fuel needs. Secondly, because of the generally shallow and poor-textured soils in the area there is no escape from the use of organic fertilizer. Apart from fuelwood, we find that some other forms of energy like kerosene, saw dust, agricultural waste, charcoal and even LPG, are also used for cooking in

individual clusters. However, looking at the number of households using them their use cannot be considered widespread. To some extent kerosene and saw-dust may be considered supplementary sources of cooking energy for a relatively small member of households.

The situation in regard to space-heating is very similar (Table-3.2). In fact a comparison of tables 3.1 and 3.2 shows virtually the same pattern of the distribution of households according to sources of energy for both cooking and space-heating. This just shows that in a vast majority of the cases the two functions are not separate but take place simultaneously. In other words space heating takes place while the food is being cooked. Thus it is hardly surprising that an overwhelming majority of the households (98 per cent overall and between 95 per cent and 100 per cent in individual clusters) reported the use of fuelwood for this purpose. The only exceptions seem to be two households in Birganga and one each in Naukuchiya Tal and Birganga who have reported the use of charcoal and electricity respectively for space-heating. Since these did not figure in the energy sources for cooking it may be presumed that they are used exclusively for space heating.

Finally coming to domestic lighting (Table-3.3) we find that the three most important sources of energy are kerosene pine sticks and electricity. Over 80 per cent of the households in all the eight clusters combined reported the use of

kerosene. In individual clusters the percentage of such households ranged between 70 and 100 in seven while in one (Kuntola) it was about 47. The use of kerosene for domestic lighting was found in all the eight clusters. Next in importance to kerosene as a source of lighting was pine sticks. Pine sticks have been traditionally used for lighting in the rural areas of Uttarakhand. Locally they are known as chhiluka and consist of the branches of pine trees (Pinus roxburghii) which give off a steady light, much like a flame torch, when ignited because of their high oil content. About 25 per cent of the households in 6 of the 8 clusters reported their use. While more households reported their use in the non-electrified clusters (Kuntola and Dhanarigad) than in the electrified ones, yet it is interesting to note that even in some of the electrified clusters they were widely used. The two clusters where the use of pine sticks was not reported viz., Naukuchiya Tal and Bhatnalagad, are the ones where the tree species is not easily available. The use of pine sticks was particularly widespread in Kuntola where about 93 per cent of the households reported their use as against only 47 per cent using kerosene. This could be due to the relatively isolated location of the cluster which may cause problems in the availability of kerosene. Furthermore there are good pine forests in and around the cluster. Only five of the eight village clusters selected by us were electrified. In each of these about one quarter of the households reported the use of electricity for domestic

lighting. Since the use of both kerosene and pine sticks was equally prevalent in these clusters, it can be presumed that only about 25 per cent of the households in the electrified villages have domestic electric connection. Finally we notice that 6 households in Ladoligad reported the use of candles for lighting.

After analysing the pattern of energy consumption in terms of sources of energy and their end-uses, we move on to estimate the total quantity of energy consumed in the different village clusters. In this analysis we have included only four sources of energy: fuelwood, kerosene, electricity and Chhiluka (Pine sticks) because as we have seen, they constitute the bulk of the energy consumed by the rural households in Uttarakhand. Table-3.4 shows that the consumption of fuelwood varies between 8253 and 17560 quintals per year in the different village clusters. In only one cluster (lower Kuthalad) was the consumption less than 10,000 quintals per year whereas in all others it was higher than this figure. In three clusters (Dhanarigad, Ladoligad and Debligad) the consumption of fuelwood ranged between 11,000 and 13,000 quintals per year, in two clusters (Naukuchiya Tal and Bhatnalagad) it ranged between 13500 and 16000 quintals per year, while in the remaining two (Kuntola and Birganga) it was around 17500 quintals per year. In all the eight clusters combined the total consumption of fuelwood came to 1,09,253 quintals per year.

The per household and per capita consumption of fuelwood also shows similar variation. The per household consumption ranges between 33 quintals per year in lower Kuthlad and 71 quintals per year in Kuntola with an overall average of 54.5 quintals per year. Similarly the per capita consumption ranges between 5 quintals per year in lower Kuthlad and about 12 quintals per year in Birganga with an overall average of about 9 quintals per year.

In general we feel that the variations in the consumption of fuelwood could be due to a number of reasons related to both need and availability. Firstly, since almost all the households collect their fuelwood and only a very small number purchase it, income or any other economic factor would hardly have any influence on the quantity consumed. Thus availability of fuelwood and of sufficient manpower (or woman power) to go to the forests for collecting it would appear to be the decisive factor influencing its consumption. Availability would largely depend on the proximity to or distance of the villages from forests-reserved, civil/soyam and panchayat. Secondly, the need for fuelwood would depend, apart from family size, on the altitude of the rural settlements. Villages situated at a higher altitude would tend to consume more fuelwood - both for cooking and space heating - because of the generally lower temperatures.

Table - 3.4

Pattern of Fuel wood Consumption Per Year (In Quintals)

Village Cluster	Total Fuelwood Consumption	Per Household Consumption	Per Capita Consumption
Naukuchiya Tal	13527.40	57.56	9.95
Kuntola	17550.00	70.77	11.37
Lower Kuthlad	8253.10	33.28	5.11
Birganga	17443.00	69.23	11.84
Ladoligad	12306.20	48.45	8.60
Dhanarigad	11382.25	45.53	7.96
Debligad	12988.00	49.95	9.10
Bhatnalagad	15803.20	62.22	8.80
T O T A L	109253.15	54.52	9.05

In the case of the village clusters selected by us we find some of these factors being responsible for the variations in the consumption of fuelwood. In general we find that fuelwood consumption is higher in those village clusters which are either close to forests or are situated at higher attitudes. Thus the consumption is highest in Kuntola and Birganga clusters which are both situated in close proximity of reserved and civil/soyam forests (see Table-2.1). Birganga, moreover, is also at a relatively higher altitude (see Table-1.4). Lower Kuthlad and Debligad are also relatively close to the forests. Yet, while the consumption of fuelwood is relatively low in the former, it is somewhat higher than the average for all the clusters in Debligad. One person for this could be the fact that Debligad is situated at a higher altitude than all the other cluster, while the altitude of Lower Kuthlod is the lowest among all the clusters.

The exceptions to this general rule of consumption being dependent on distance from forests are Naukuchiya Tal and Bhatnalagad which are both situated furthest among all the clusters from reserved forests and yet have relatively high consumption of fuelwood. Both these clusters are situated in the middle altitude range of 4500-5000 feet (Table-1.4). One would therefore, have to seek an explanation of this phenomenon in terms of other factors. One possible explanation

could be that clusters which have both reserved forests and civil/soyam forests available for meeting their fuelwood needs and with atleast one of them being in close proximity tend to show a higher consumption. This seems to fit the pattern of variation observed in our data. Possibly the number of persons per household (or per cluster) available for collecting fuelwood may also exert some influence on the quantity consumed.

After fuelwood the next most important source of energy in the rural areas of Uttarakhand is Kerosene, which as we have seen was used in all the clusters. Table 3.5 gives cluster wise information about the total quantity consumed as well as the per household and per capita consumption per year. It will be seen, that as in the case of fuelwood, there is considerable variation in the consumption of kerosene as well in the different village clusters. The total consumption ranged between approximately 3500 litres per year in Kuntola and about 1900 litres per year in Lodligad. In three clusters viz. Bhatnalagad, Dhanarigad and Lower Kathlad, the consumption ranged between 6600 litre and about 9000 litre per year while in another three viz., Debligad, Naukuchiya Tal and Birganga it was between 12000 litres and 13200 litres per year. The total consumption of kerosene in all the eight clusters together came to 84377 litres.

The annual consumption of kerosene oil per household and per capita also follow a similar pattern. Per household

consumption of kerosene varied between 14 litres per year in Kuntola and about 75 litres per year in Ladoligad with an overall average of 42 litres. Per capita consumption ranged from 2.25 litres per year to 13.25 litres per year in the same clusters. The average for all the clusters came to about 7 litres per year.

Two factors may influence the consumption of kerosene: the economic condition of the household because of kerosene oil being a commercial source of energy and availability of the product. It appears that of the two reasons the latter is more important. While it is true that the two clusters which show the lowest consumption of Kerosene viz, Kuntola and Bhatnalagad, also happen to be economically relatively backward, we also find that in two other clusters which are economically quite well-off the consumption of kerosene is not very high. These are Dhanarigad and Lower Kuthlad. Interestingly, the three clusters which were not electrified viz, Kuntola, Dhanarigad and Bhatnalagad, also consumed less kerosene than the electrified ones. Thus one is led to seek an explanation for inter-cluster variation in the consumption of kerosene oil in its availability. The factor that would influence the availability of kerosene oil would be the distance of the cluster from the nearest market centre or town. Referring once again to Table 2.1 we find a close relation between consumption of kerosene oil and distance of the clusters from the nearest town. Bhatnalagad and Kuntola are located farthest

Table - 3.5

Consumption of Kerosene per year (in litre)

Village Cluster	Total kerosene Consumption	Per household Consumption	Per capita Consumption
Naukuchiya Tal	12899	54.89 (79.13)	9.48
Kuntola	3513	14.00 (30.03)	2.28
Lower Kuthlad	8952	36.10 (45.69)	5.54
Birganga	13203	52.39 (60.01)	8.96
Ladoligad	18978	74.72 (78.75)	13.26
Dhanarigad	8203	32.81 (37.98)	5.35
Debligad	12016	46.22 (58.05)	8.41
Bhatnalagad	6613	26.04 (26.04)	3.68
T O T A L	84377	42.10 (52.28)	6.99

from the nearest town - between 10 and 17 kms away - and they consumed the least amount of kerosene. Ladoligad, on the other hand is closest to a town 1.5 to 3 kms away and consumed the highest quantity. In the case of the other clusters too there is a close relationship between consumption of kerosene and distance from the nearest town. Thus both Dhanarigad and Lower Kuthlad are located between 5 and 8 kms from the nearest town and registered a lower consumption than the other clusters which are situated closer to towns - between 3 and 6 kms away.

It is thus quite clear that the remote clusters have a lower consumption of kerosene than those located in the proximity of towns and market centres. This does not necessarily imply that the demand for kerosene oil is also lower in the relatively isolated places. The problem is that kerosene oil is not easily available at such places. It is common knowledge that kerosene oil is sold only through designated outlets and even in the cities people do not get their supplies readily and have to make frequent trips to the retail outlets. Evidently the problem would be many times greater in remore hill locations where the only way to reach market centres is on foot. In such a situation the people have to either manage with less than what they need or pay higher prices to save themselves the botheration of having to walk frequently to the market places. We received numerous reports of not only non-availability of kerosene but also of high prices - higher than those fixed by the government.

Finally we take up the consumption of electricity, which is the next most important source of commercial energy. As we have already seen, electricity like kerosene oil is used almost exclusively for domestic lighting. There is hardly any use of electricity in agriculture and power-using industrial units in the rural areas of Uttarakhand are also very few in number.

Table 3.6 gives an idea of the consumption of electricity in the different clusters. It will be seen that out of the eight clusters, three were non-electrified. In the electrified clusters the consumption varied from 16,275 K.Wh per year in Birganga to 44000 K.Wh per year in Ladoligad, with two clusters viz, Delbigad and Lower Kuthlad reporting consumption in the range of 16700-19000 K.Wh per year and Naukuchiya Tal reporting a consumption of about 24000 K.Wh per year. The variation in the per household consumption is, however, not as large-it being between 260 and 400 K.Wh per year. The highest value of consumption per household, however, was found to be in Naukuchiya Tal (450 K.Wh) followed by Ladoligad (355 K.Wh), Lower Kuthlad (308 K.Wh) Birganga (296 K.Wh) and Debligad (261 K.Wh). The average for all the five electrified clusters was 399 K.Wh per household per year. It may be mentioned here that the per household consumption figures refer only to the electrified households.

It will be seen from table 3.3 that the number of households electrified in the electrified clusters is very small. Except in Ladoligad, where about 30 per cent of the households are electrified, the percentage of electrified households in the other clusters ranges between 23 and 27. Overall we find that only 16 per cent of all households have electricity. Thus even as a source of domestic lighting the benefit of electricity is available to only a very small proportion of the households in the rural areas of Uttarakhand.

We conclude this discussion of by looking at the share of different sources of energy in the total energy consumption at the household level in the different clusters. This will give us a clear idea of the relative importance of different energy sources. The comparison has been made in terms of the calorific values of the different fuels. The total consumption has been converted into kilo calories using the following conversion factors supplied by the Advisory Board on Energy :

Kerosene	10,300 K Cal/Kg
Firewood (and Chhiluka)	4,750 "
Agricultural Waste	4,250 "
Electricity	860 K Cal/K.Wh

Furthermore, we have also tried to compare the share of the different sources of energy in terms of useful energy available from the different fuels. This has been computed on the basis of appliance efficiency estimates supplied by the

Advisory Board on Energy as follows :

Kerosene (lighting)	1%
Firewood (Cooking)	8%
Electricity (Lighting)	10%
Chhiluka (Lighting)	10%
Agricultural Waste (Cooking)	8%

The relevant data are given in Tables 3.7 and 3.8. It will be seen that in all the eight clusters combined about 93 per cent of the energy consumed at the household level is provided by fuelwood, about 4.5 per cent by Chhiluka, about 1.3 per cent by kerosene and agricultural waste and only 0.2 per cent by electricity. In individual clusters the share of fuelwood in total energy consumption varies between 84.1 per cent and 98.5 per cent, of kerosene oil between 0.3 and 2.5 per cent, and of electricity between 0.2 and 0.6 per cent (three clusters being non-electrified). Thus it is clear that an overwhelmingly large share of household energy in the rural areas of Uttarakhand is provided by fuelwood. The importance of fuelwood becomes even greater when we take into account the useful energy available at the household level. In all the eight clusters combined the share of fuelwood then goes up to over 99 per cent while that of kerosene oil declines to less than 0.2 per cent. The share of electricity remains more or less the same. The reason for this shift in the relative share of different fuels is that kerosene oil is used exclusively for lighting and its efficiency for this purpose

is only one percent. In individual clusters the share of fuelwood at the household level in useful energy terms ranges between 98.9 per cent and almost 100 per cent.

Thus it should be quite obvious that the single most important source of energy in the rural areas of Uttarakhand is fuelwood. Hence the focus of any energy policy ought to be on increasing its supply and availability without causing any more damage to the existing forest resources. This implis a vigorous programme of raising fuelwood plantations in and around the villages on village common and barren lands. We shall have more to say about this later on in the report.

Secondly the need for domestic lighting is also very great. The major sources of energy for this purpose are Chhiluka (pine sticks) kerosene oil and electricity. It is interesting to observe that in all the eight clusters combined Chhiluka accounts for a much higher share of total energy consumption than either kerosene oil or electricity, in terms of both calorific value as well as useful energy. Thus we find that in terms of calorific value about 4.5 per cent of total energy is supplied by Chhiluka, 1.2 per cent by kerosene and less than 0.2 per cent by electricity. In terms of useful energy the share of Chhiluka in total energy consumption comes to 0.56 per cent as against 0.16 per cent and 0.24 per cent for kerosene and electricity. In other words of the total energy consumed in domestic lighting in all the eight clusters,

Table - 3.7

Pattern of Energy Consumption in terms of Calorific Value (Unit. 106 K. Calories)

Clusters	Total Energy Consumption					Per capita useful Energy Consum.
	Fuel Wood	Kerosene	Electri-city	Chhiluka	Agri. Waste	
Naukuchiya Tal	6425.52 (98.11)	103.39	20.52	-	-	4.82
Kuntola	8336.25 (84.08)	28.16 (0.28)	-	1136.44 (11.46)	413.62 (4.17)	6.43
Lower Kuthlad	3920.22 (93.05)	71.76 (1.70)	16.43 (0.39)	204.49 (4.85)	-	2.57
Birganga	8285.43 (98.49)	105.83 (1.26)	14.00 (0.17)	7.60 (0.69)	-	5.71
Ladoligad	5845.45 (96.68)	152.12 (2.52)	37.86 (0.63)	10.69 (0.18)	-	4.22
Dhanarigad	5406.57 (90.97)	65.75 (1.11)	-	470.98 (7.92)	-	4.16
Debligad	6169.30 (94.17)	96.31 (1.47)	14.40 (0.22)	271.23 (1.14)	-	4.59
Bhatnagad	7506.52 (91.60)	53.01 (0.65)	-	382.49 (4.67)	253.26 (3.09)	4.57
T O T A L	51895.25 (92.96)	676.32 (1.21)	103.20 (0.18)	2483.91 (4.45)	666.88 (1.19)	4.62

NOTE : Figures in brackets represent percentages.

Table - 3.8

Pattern of Energy Consumption in terms of useful energy
(Unit : 106 K. Calories)

Clusters	Total Energy Consumption					Per Capita useful Energy Consum.
	Fuel wood	Kerosene	Electri-city	Chhiluka	Agri. Waste	
Naukuchiya Tal	514.04 (99.40)	1.03 (0.20)	2.05 (0.40)	-	-	0.38
Kuntola	666.90 (93.71)	0.28 (0.04)	-	11.36 (1.60)	33.09 (4.65)	0.46
Lower Kuthlad	313.62 (93.22)	0.72 (0.21)	1.64 (0.49)	20.45 (6.08)	-	0.21
Birganga	662.83 (99.62)	1.06 (0.16)	1.40 (0.21)	0.08 (0.01)	-	0.45
Ladoligad	467.63 (98.85)	1.52 (0.32)	3.79 (0.80)	0.11 (0.02)	-	0.33
Dhanarigad	432.53 (98.77)	0.66 (0.15)	-	4.71 (1.80)	-	0.31
Debligad	493.54 (98.98)	0.96 (0.19)	1.44 (0.29)	2.71 (0.54)	- (0.54)	0.35
Bhatnalagad	600.52 (97.06)	0.53 (0.08)	-	3.82 (06.61)	3.82 (0.61)	0.35
T O T A L	4151.62 (97.76)	6.67 (0.16)	10.32 (0.24)	24.84 (0.58)	53.35 (1.26)	0.35

NOTE : Figures in brackets represent percentages.

the share of Chhiluka comes to 76 per cent in terms of total calorific value and 59 per cent in terms of useful energy. In five clusters viz, Kuntola, Lower Kuthlad, Dhanarigad, Debligad and Bhatnagad where the use of Chhiluka in widespread its share in the energy used for lighting is even higher. It is thus clear that, as in the case of cooking the bulk of the energy needs of the rural household for domestic lighting is also provided by non-commercial sources i.e. Chhiluka which the households collect from the nearby forests.

CHAPTER IV

ENERGY USE IN THE RURAL AREAS : ISSUES AND PROBLEMS

The last chapter presented a detailed analysis of the energy consumption pattern in the eight village clusters. In this chapter an attempt has been made to take a closer look at some of the problems of rural energy at the micro-level. In particular we have focussed on the issue of energy use in agriculture, especially on operations like tilling, threshing and irrigation, on transportation of goods and people, and on the problems associated with the fulfilment of the energy needs of the people. The last-named issue examines questions like seasonal variations in firewood consumption, source of fuelwood, number of people engaged in collecting it and time taken. We have finally tried to assess the people's perceptions on the energy (especially firewood) problems being faced by them.

Energy Use in Agriculture

We begin our analysis by taking a look at the various forms of energy used in agriculture, especially in operations like tilling, threshing and irrigation. The relevant data are presented in Tables 4.1 and 4.2. It will be seen that in tilling the predominant source of energy used is animal power (bullocks). Over 95 per cent of households in all the eight clusters (1913 out of 2004*) reported the use of bullocks for

*The remaining households did not respond.

Table 4.1 : Distribution of Households by Means of Energy Used for Tilling

Village Cluster	Bullocks	Humanpower
Naukuchiya Tal	201 (85.53)	
Kuntola	245 (97.61)	
Lower Kuthlad	236 (95.16)	
Birganga	226 (89.68)	
Ladoligad	254 (100.00)	
Dhanarigad	250 (100.00)	
Debligad	253 (97.31)	3 (1.15)
Bhatnalagad	248 (97.64)	2 (0.79)
TOTAL	1913 (95.46)	5 (0.25)

(Figures in parentheses represent percentage of households)

Table 4.2 : Distribution of Households by Means of Energy Used for Threshing

Village Cluster	Bullocks	Humanpower
Naukuchiya Tal		
Kuntola		
Lower Kuthlad		1
Birganga	1	13
Ladoligad	200	318
Dhanarigad	103	195
Debligad	237	426
Bhatnalagad	132	175
TOTAL	673	1128

tilling. In individual clusters this percentage ranges between 86 per cent in Naukuchiya Tal and 100 per cent in Ladoligad and Dhanarigad. Only 5 households (3 in Debligad and 2 in Bhatnalagad) reported use of human power for tilling, which implies they did not have bullocks and cultivated the land by hand tilling it.

For threshing too the rural households are dependent mainly on animal power and human power. The response of the households to this information has not been too good. There was no response in two clusters (Naukuchiya Tal and Kuntola), only one household responded in Lower Kuthlad and 13 in

Birganga. The data from the other clusters show that all the households are dependent on either animal power and/or human power for threshing. Many households, in fact, use both these sources and have responded so.

As far as irrigation is concerned we find that the situation in the rural areas of Uttarakhand is quite different from that in the plains, where irrigation is the single-most important consumer of commercial energy in the rural areas. None of the households in our sample reported use of any form of commercial energy for irrigation which is entirely dependent on gravity channels (locally known as Guls) supplemented by human power.

Thus what merges quite clearly from the data is the total absence of any kind of commercial energy input into agriculture in the rural areas of Uttarakhand. Agricultural operations are totally dependent on animal power combined with human power (in which incidentally the share of "women-power" is quite high as most of the agricultural operations, apart from ploughing, are generally performed by women who are the backbone of the agricultural labour force in the area).

Irrigation too is dependent on gravity channels. This only substantiates the view put forward in Chapter II that though agriculture is the main source of livelihood for the

bulk of the population, it is essentially a subsistence activity. With very low levels of commercialisation, it is but natural that the input of commercial energy in agriculture would also be very low. Besides the land-holding pattern and the nature of the terrian is also such that it acts as a major inhibiting factor on the use of commercial energy in agriculture. There is almost a total absence of any power-using machinery among the rural households in the hills. In our sample only six households (all in the Bhatnalagad cluster) reported use of some power-using machinery.

Energy Use in Transport

We next take up a discussion of the extent to which people in our sample area are dependent on energy-using means of transport (mainly buses and trucks) for their own needs. The transport needs of the people have been considered separately for (i) transport of goods and services to and from the market places; and (ii) means of transport used by the people to visit different places. Table 4.3 gives an idea of the means of transport used by the households for haulage of goods. The different means of transport used have been identified as trucks, buses, back-load and animals. Only the first two use commercial energy.

Table 4.3 : Distribution of Households by Means of Transport Used for Haulage of Goods

Village Cluster	Truck	Bus	Backload	Animals	Other	No response	Total
Naukuchiya Tal	1 (0.43)	59 (25.11)	164 (69.79)	3 (1.28)	-	8 (3.40)	235 (100.00)
Kuntola	-	-	246 (98.01)	4 (1.59)	-	1 (0.40)	251 (100.00)
Lower Kuthlad	-	22 (8.87)	198 (79.87)	1 (0.40)	27 (10.89)	-	248 (100.00)
Birganga	-	27 (10.71)	196 (77.78)	28 (11.11)	1 (0.40)	-	252 (100.00)
Ladoligad	10 (3.94)	15 (5.91)	219 (86.22)	5 (1.97)	-	5 (1.97)	254 (100.00)
Dhanarigad	1 (0.40)	4 (1.60)	224 (89.60)	20 (8.00)	1 (0.40)	-	250 (100.00)
Debligad	-	-	233 (89.62)	13 (5.00)	-	14 (5.38)	260 (100.00)
Bhatnalagad	-	7 (2.76)	228 (89.76)	7 (2.76)	-	12 (4.72)	254 (100.00)
TOTAL	12 (0.60)	134 (6.69)	1708 (85.23)	81 (4.04)	29 (1.45)	40 (2.00)	2004 (100.00)

It will be seen that an overwhelming majority (85 per cent in all the clusters combined) of the households are dependent on human-power (back-loads) for the transport of goods to and from the market. The percentage of such households varies between a low of about 70 in Naukuchiya Tal and a high of 98 per cent in Kuntola (incidentally Kuntola is not connected by a moterable road). Next in importance as a means of haulage

come buses which are used by about 7 per cent of the households, and animals (chiefly mules) used by about 4 per cent of the households. While animals are used in all the clusters, buses are used in only 6 of them - the other two clusters viz., Kuntola and Debligad not being connected by motorable roads. The maximum number of households using buses for haulage of goods is in Naukuchiya Tal where 25 per cent reported doing so. This cluster, as we have remarked earlier, is the best connected as it is close to good roads as well as to important towns like Naini Tal the district headquarter, Kathgodam the rail-head and Haldwani, an important market-town in the foothills from where all the supplies to the hills come. The other clusters where a sizeable number of households report the use of buses are Birganga (about 11 per cent), Lower Kuthlad (about 9 per cent) and Ladoligad (about 6 per cent).

The use of trucks for haulage of goods is not very important in our sample. In all only 12 households (constituting only 0.6 per cent of all households) in three clusters reported the transport of goods by trucks. Out of these 10 households (accounting for about 4 per cent of the households in the cluster) belonged to Ladoligad alone. In the remaining two clusters only one household in each said that they use trucks.

Though haulage of goods on animals (mule-packs) is to be found in all the eight clusters, in only three of them do we

find that more than 5 per cent of the households do so. These clusters are Birganga, Dhanarigad and Debligad where 11 per cent, 8 per cent and 5 per cent respectively of all households resort to this mode of transport of goods. In the remaining clusters between 0.4 and 2.76 per cent of the households have reported the use of animals for this purpose.

Thus overall we find that in the rural areas of Uttarakhand the dependence of the people on energy-using means for transport of goods to and from the market place is very low. Most of the people still carry goods on their backs. A few have started using buses while some use animals. Obviously trucks, buses and animals must be used for heavier loads while the lighter ones are carried on the back. What this implies is that volume of transactions is rather low so that people can carry whatever they have to buy or sell on their backs, thereby only confirming our observation about generally low level of commercialisation of the agricultural economy in Uttarakhand.

The position is somewhat similar in regard to transport for personal travel, though the use of buses is much higher (see Table 4.4). Overall we find that 64 per cent of the households report that they travel on foot when they have to visit places outside their village. About 29 per cent travel by buses and another 5 per cent report the use of trucks even for personal travel. Thus almost two-thirds of the households walk to various

places and only one-third use any kind of mechanised (energy-using) transport. The percentage of households who habitually travel on foot is exceptionally high in two clusters viz., Kuntola and Dhanarigad. This is quite understandable in view of the fact that none of the villages in the Kuntola cluster and most of them in Dhanarigad are near motorable roads. Hence, most of the people, perforce, have to travel on foot.

In two clusters we find a large number of people making trips by bus. These are Ladoligad and Debligad where about 89 per cent and about 65 per cent of the households respectively report the use of buses. While the former is pretty well connected by motorable roads, the villages in the latter are at some distance from the road. Hence the use of buses by such large numbers in Debligad is somewhat surprising. The only possible explanation for this could be that most of their trips are to Mussorie which is at a distance of 25-35 Kms. from various villages of this cluster. The only way to get to Mussorie is by bus available from Dhanaulti situated about 5-7.5 Kms. walk from the villages of this cluster. Thus to get to Mussoorie they would have to walk part of the way and take the bus for the remaining part of the distance.

Finally we notice from Table 4.4 that in Bhatnalagad about 28 per cent of the households report that they travel by truck. This cluster too is situated at a considerable distance - 14 to 17 Kms. - from the nearest motorable road. The bus service on

Table 4.4 : Distribution of Households by means of transport used for personal travel

Village Cluster	Bus	Truck	On Foot	Other	No Response	Total
Naukuchiya Tal	55 (23.40)	1 (0.43)	179 (76.17)	-	-	235 (100.00)
Kuntola	-	-	249 (99.20)	-	2 (0.80)	251 (100.00)
Lower Kuthlad	77 (31.05)	16 (6.45)	155 (62.50)	-	-	248 (100.00)
Birganga	55 (21.83)	2 (0.79)	194 (76.98)	1 (0.40)	-	252 (100.00)
Ladoligad	226 (88.98)	2 (0.79)	16 (6.30)	-	10 (3.94)	254 (100.00)
Dhanarigad	-	18 (7.20)	231 (92.40)	1 (0.40)	-	250 (100.00)
Debligad	168 (64.62)	1 (0.38)	79 (30.38)	1 (0.38)	11 (4.23)	260 (100.00)
Bhatnalagad	-	70 (27.56)	173 (68.11)	-	11 (4.33)	254 (100.00)
TOTAL	581 (28.99)	110 (5.49)	1276 (63.67)	3 (0.15)	34 (1.70)	2004 (100.00)

this route is also very unreliable as only one bus travels each way on this route viz., the Sahiya-Phedulani route. Thus if the villagers have to travel to Sahiya, Chakrata or Dehra Dun (the main towns in the area) they would have to walk up to the motor road and take whatever mode of transport is available (generally a passing truck) if they happen to reach at a time when the only bus is not available.

Thus we find that the rural people of Uttarakhand are still dependent largely on their own motive power for travelling from place to place. Wherever motorable roads and bus services are available they are taking recourse to mechanised transport, and the use of buses (and sometimes even trucks) is quite common. Yet, we get the distinct that such means are used primarily for longer-distance travel.

Problems of Meeting Energy Needs

We now, turn our attention to some of the important issues pertaining to the rural energy situation in Uttarakhand. These include the question of seasonal variations in the use of fuelwood, how many households depend on collection for meeting their fuelwood needs, who collects, how often do they collect, and how much time is spent on this activity, and what is the perception of the people with regard to the present situation and possible future scenarios of the rural energy scene.

We begin by analysing the seasonal variations in fuelwood consumption as reported by the households in our sample. The objective here is to find out whether there are any major variations between summer and winter consumption - the assumption being that winter consumption ought to be higher than summer consumption because of the higher need for space-heating. The relevant data are presented in Table 4.5.

Table 4.5 : Seasonal Variation in Consumption of Fuelwood (Winter Consumption as a proportion of summer consumption)

Name of Cluster	No. of households reporting					
	1.5 times	2 times	2.5 times	3 times	No response	Total
Naukuchiya Tal	152 (64.68)	55 (23.40)	-	1 (0.43)	27 (11.49)	235 (100.00)
Kuntola	1 (0.40)	184 (73.31)	25 (9.96)	40 (15.94)	1 (0.40)	251 (100.00)
Lower Kuthlad	13 (5.24)	203 (81.85)	24 (9.68)	2 (0.81)	6 (2.42)	248 (100.00)
Birganga	44 (17.46)	148 (58.73)	3 (1.19)	37 (14.68)	20 (7.94)	252 (100.00)
Ladoligad	134 (52.76)	111 (43.70)	3 (1.18)	1 (0.39)	5 (1.97)	254 (100.00)
Dhanarigad	151 (60.40)	97 (38.80)	1 (0.40)	-	1 (0.40)	250 (100.00)
Debligad	61 (23.46)	191 (73.46)	2 (0.77)	1 (0.38)	5 (1.92)	260 (100.00)
Bhatnalagad	103 (40.55)	95 (37.40)	12 (4.72)	1 (0.39)	43 (16.93)	254 (100.00)
TOTAL	659 (32.88)	1084 (54.09)	70 (3.49)	83 (4.14)	108 (5.39)	2004 (100.00)

Figures in parentheses represent percentages.

It will be seen that altogether over half the households report that their winter consumption of fuelwood is twice the summer consumption. Another one-third report that it is more than two times. Thus for about 87 per cent of the households the consumption of fuelwood in winter months is between one and a half and two times the average consumption during summer months.

In individual clusters we find considerable variation in the pattern of winter and summer consumption. In three clusters viz, Ladoligad, Naukuchiya Tal and Dhanarigad more than half the households reported that their consumption of fuelwood in winter was one and a half times that of summer, while in another cluster, Bhatnalagad about 40 per cent of the households reported so. At the other extreme only one household out 251 in Kuntola used one and a half times the quantity in winter as compared to summer, while 73 per cent used twice the quantity, 10 per cent used two and a half times and as many as 16 per cent reported that they used three times as much in winter as in summer. A somewhat similar pattern is also to be found in : (i) Lower Kuthlad where about 82 per cent of the households reported that winter consumption was twice that of summer and about 10 per cent felt it was two-and-a-half times (ii) Debligad where about 73 per cent of the households reported that winter consumption was twice that of summer, and (iii) Birganga where about 59 per cent of the households reported using twice the quantity in winter as

compared to summer and about 15 per cent felt it was three times as much.

Under normal circumstances i.e. other things being equal one would expect that the variation in summer and winter consumption of fuelwood would be related in some way to altitude. However in our case we do not find altitude to be the explanatory factor as clusters in the same altitudinal range viz Naukuchiya Tal, Dhanarigad and Bhatnalagad on the one hand and Kuntola and Ladoligad on the other (see Table 1.4) show considerable inter-cluster differences in the pattern of winter and summer variation. Furthermore, the cluster in the lowest altitudinal zone (Lower Kuthlad) shows higher use in winter as compared to summer than most of the other clusters, while the cluster in the highest zone (Debligad) does not show the highest use in winter relative to summer among all the clusters.

Thus we are led to believe that as in the case of total fuelwood consumption analysed in Chapter III, here too the explanation may be found in the distance from or premixity to forests, especially reserve forests. Clusters which are close to reserve forests viz., Kuntola, Lower Kuthlad, Birganga and Debligad (see Table 2.1) inevitably show higher consumption in winter months relative to summer months than clusters which are at some distance from reserve forests (especially clusters like Naukuchiya Tal, Bhatnalagad, Ladoligad and Dhanarigad). Thus it

is availability rather than any other factor which influences how much more fuelwood would be used in winter as compared to summer.

This argument is substantiated by our finding that more than half the total quantity of fuelwood consumed in all the clusters comes from reserved forests. The share of civil/soyam and panchayat forests is 19 and 22 per cent respectively (see Table 4.6).

It is only in one cluster viz Birganga that we find only a small part of fuelwood consumption coming from reserved forests. In this case it is only 6.75 per cent, whereas 72 per cent comes from panchayat forests which is an unusually high figure in comparison to the other clusters. In fact only three clusters report fuelwood supply from panchayat forests. These are Naukuchiya Tal, Lower Kuthlad and Birganga. The high share of fuelwood from panchayat forests in Birganga also tends to push up the average contribution of this source in all the clusters. In the remaining clusters reserved forests account for between 57 per cent and 92 per cent of total fuelwood consumption. Civil/Soyam forests are a major source of fuelwood in one cluster (Kuntola) and quite important in three others (Birganga, Naukuchiya Tal and Bhatnalagad). Private forests, on the other hand are an important source only in 2 clusters viz., Naukuchiya Tal (with a share of 10.5 per cent) and Bhatnalagad (with a share of about 26 per cent).

Table 4.6 : Percentage share of Different Types of Forest in Total Fuelwood Consumption

Village Cluster	Source of Fuelwood					
	Reserved forest	Civil/Soyam forest	Pancha-yat forest	Private forest	Others (incl. Pvt. trees)	Total
Naukuchiya Tal	64.95	8.41	14.18	10.45	2.00	100.00
Kuntola	57.17	42.72	-	0.02	0.09	
Lower Kuthlad	80.17	10.88	7.24	0.44	1.27	
Birganga	6.75	20.87	72.27	0.10	-	
Ladoligad	87.51	-	-	-	12.49	
Dhanarigad	91.83	-	-	0.05	8.11	
Debligad	87.64	0.37	-	0.72	11.28	
Bhatnalagad	51.97	7.58	1.85	25.98	12.63	
TOTAL	51.03	19.42	22.35	3.36	3.84	

Thus we find that reserved forests are the most important source of fuelwood supply in an overall sense. However, in individual clusters other types of forests also pay an important though secondary role in meeting peoples fuelwood needs, but their importance depends on their availability and condition in different areas.

Furthermore we find that over 96 per cent of the households in all depend on collection of fuelwood (Table 4.7). In individual clusters this proportion varies between 93 per cent

Table 4.7 : Frequency Distribution of Households reporting collection of fuelwood.

Village Cluster	Fuelwood	No. of members engaged	Percentage of women engaged	Average time taken per household (hrs./yr.)
Naukuchiya Tal	218 (92.77)	413	46.28	280
Kuntola	249 (99.20)	496	49.50	434
Lower Kuthlad	244 (98.39)	372	70.03	348
Birganga	246 (97.62)	492	45.67	589
Ladoligad	238 (93.70)	484	38.94	375
Dhanarigad	245 (98.00)	500	40.25	357
Debligad	254 (97.69)	325*	59.12	484
Bhatnalagad	238 (93.70)	462	51.40	1017
TOTAL	1932 (96.41)	3544	49.34	485

* In 70 cases in one village the number of persons engaged is not mentioned.

Figures in parentheses represent percentage of households.

and 99 per cent. Thus fuelwood is essentially a free resource for the vast majority of the rural households. However, considerable manpower and time has to be expended on its collection. It will be seen that 3544 persons from 2004 households, giving an average of 1.8 persons per household, are engaged on this job. Significantly almost half the labour spent on collection of fuelwood is provided by women. In individual clusters the contribution of female labour to household fuelwood collection ranges between 39 per cent and 70 per cent. The average time spent on collection of fuelwood is, however, not very high. In all the eight clusters combined it comes to 485 hours per household per year or about 1.33 hours per day. In individual clusters the time spent on this activity varies from a low of 280 hours per household per year (or 0.77 hours per day) in Naukuchiya Tal to 1017 hours per household per year (or 2.79 hours per day in Bhatnalagad.

However, it will be seen from Table 4.8 that most of the households in all the clusters collect their fuelwood either on a monthly basis or at specific periods during the year - generally between November and February when the pressure of agricultural work is low and the people (especially women) have more time for this activity on their hands. Very few households reported daily collection while relatively more reported that they do so weekly. Thus it would appear that the time spent would be relatively higher per day if only the days on which

Table 4.8 : Distribution of Responses Regarding Frequency of Fuelwood Collection

Village Cluster	Number of Responses						Total Response
	Daily	Weekly	Monthly	Specific months in a year (Nov.-Feb.)	Other months	No Response	
Naukuchiya Tal	9	7	171	36	-	7	230
Kuntola	23	8	158	56	-	6	251
Lower Kuthlad	3	4	100	182	1	8	298
Birganga	20	28	179	12	-	13	252
Ladoligad	2	208	26	10	-	13	259
Dhanarigad	1	93	72	85	1	29	281
Debligad	4	74	115	101	-	-	294
Bhatnalagad	10	6	234	31	-	-	281
TOTAL	72	428	1055	513	2	76	2146

fuelwood is collected is taken into account. For example if we assume that among the 1055 responses which report monthly collection, an average of 5 days a month is devoted to this activity, then the total time spent would come to about 8 hours per day on those particular days. Similarly if 15 days a month are spent on an average between November and February by those households who collect fuelwood during this period, then they too would be spending on an average about 8 hours per day. This is in fact what the people, especially the women, reported when

we asked informally how long it takes them to collect fuelwood per day. Thus it would be reasonable to conclude that if the time spent is spread over the entire year, then it cannot be considered high. However, on the days on which fuelwood is actually collected which may be about 60 days in a year on the average, the time spent is quite high occupying the better part of the day.

A caveat may be in order at this point. Our calculations provide only a very rough estimate of the time spent on this activity. For a more accurate estimate a proper time - disposition study may be needed. It should also be borne in mind that collection of fuelwood is also combined with many other kinds of work like taking the cattle out to pasture, collection of fodder or looking after the fields on the way to or from the forest. The proportion of time spent on these activities would have to be fully accounted for in arriving at any proper estimate.

We finally take up an analysis of the rural energy scene as perceived by the people. The purpose here was to find out how the people themselves view the energy problems faced by them in terms of availability and consumption of fuelwood and other energy sources, time taken to collect fuelwood, distance of forests as compared to the situation ten years back, and how they perceive the future in terms of availability of fuelwood, as well some of the reasons for the changes which they perceive.

The relevant data are presented in summarised form in Table 4.9. Instead of giving information for each cluster separately, we have presented the percentage distribution of households in all the light clusters on seven major issues which affect the rural households of Uttarakhand. These are the differences as perceived by them in availability of fuelwood, quantity of fuelwood consumed, distance from forests, time taken to collect fuelwood, availability of Kerosene oil, electricity etc and quantity of Kerosene oil and electricity consumed during the past ten years and their perception of the availability of fuelwood in future.

It will be quite clear from the table that an overwhelming majority of the rural households (about 78 percent) feel that the availability of fuelwood has declined during the last ten years. Similarly about 69 per cent feel that during the same period the distance from the forests has increased while about 87 say that the time taken to collect fuelwood has also gone up. Furthermore over 92 per cent of the households also feel that in future the availability of fuelwood will be even less. Thus from the people's point of view the situation with regard to fuelwood, which is the main source of energy in the rural areas of Uttarakhand, has deteriorated during the last ten years and is likely to become much worse in the future as well. On the other hand we also find about 48 per cent of the households say that their consumption of fuelwood has increased during this period while another 32 per cent say it has remained the same.

Table 4.9 : Peoples' Perception of Rural Energy Problems : Situation Today As Compared to Ten Years Back.

(Percent of Households)

	More	Same	Less	No Response	Total
Availability of fuelwood	8.78	12.48	77.89	0.85	100
Consumption of fuelwood	47.91	31.79	18.81	1.49	100
Distance of Forests	69.41	26.65	2.55	1.39	100
Availability of Kerosene, electricity, etc.	44.31	39.22	11.63	4.84	100
Consumption of Energy Sources other than fuelwood.	41.62	33.88	5.34	19.16	100
Time taken to Collect Fuelwood	86.63	9.63	1.75	1.99	100
Availability of fuelwood in future	0.55	4.39	92.46	2.60	100

Only about 19 per cent report a decline in consumption. There is quite clearly a paradox here : while a vast majority report a decline in availability a fairly large proportion also report an increase in consumption. This perhaps only shows that forest resources in and near the villages have been gradually depleting, but the people are willing to travel longer distances and invest more time in collecting fuelwood rather than cut down on their consumption. Probably the situation is not all that alarming as to force the people to sit up and do something drastic about it. This seems to be confirmed by the fact that the time taken to collect fuelwood on an annual basis is not all that high as

is sometimes made out to be. The question therefore arises that at what point in the destruction of forests would the people be forced to take notice and adopt positive steps like reduction in consumption through energy conservation or other measures. At present this question appears hypothetical in the people's consciousness as sufficient forest resources, albeit at a greater distance from their villages than in the past, are available for meeting their needs. However very soon it may become an urgent, once the existing forest resources are also depleted.

Finally we asked the people to identify some of the factors which, in their view, were responsible for a change in the availability of fuelwood during the past ten years. Since this was a multiple response question many of the households identified more than one factor. Thus we got 3251 responses from 2004 households. Analysis of these responses shows interesting results (see Table 4.10).

Table 4.10 : Factors Responsible for Change in Availability of Fuelwood During the past Ten Years.

(% of responses N=3251)

Cutting of forests by people	24.08
Cutting of forests of Govt./ Contractors	22.89
Fire	5.51
Storms etc	5.17
Occupation of forest land	9.32
Population pressure	21.47
Others	11.57

Thus three factors accounting for over two-thirds of the responses stand out in the peoples minds as being responsible for the reduced availability of fuelwood. These are cutting of forests by the people themselves, cutting of forests by the government and/or contractors and higher demand for fuelwood because of rising population. The first accounts for 24 per cent of the responses, the second for about 23 per cent and the last for 21 per cent. Moreover about 9 per cent of the responses put the blame on occupation of forest land and its cultivation by the people. Thus it is quite clear that the people put the major part of the responsibility on themselves and secondly on the government and forest contractors for the depletion of forest resources.

This feeling could perhaps be utilised in some way to encourage the people of the rural areas to take an active interest in plantation and afforestation programme, which have not achieved much success so far. One of the reasons for peoples apathy towards government sponsored afforestation programmes is a strong feeling among them that such programmes are meant to raise trees of commercial value which will not benefit them in any way. The fact that almost as much blame for deforestation is put on the Forest Department and the contractors as on the people themselves provides some confirmation for this feeling. Without people's active involvement and participation, it appears difficult to carry out successful programme of large-scale

afforestation and plantation, especially outside the Reserved Forest Areas. The importance of such a programme, especially in areas close to rural settlements which bear the brunt of the axe for meeting the fuelwood needs of the people, cannot be over-emphasised keeping in mind both the present demand for fuelwood and the likely increase in future.

It is easy to talk of peoples' participation but difficult to implement it in practice as past experience shows only too well. In this case, fortunately, it may be possible to secure such participation if one could follow a two-pronged strategy. On the one hand build on the apprehension which people have for the future supply of fuelwood and encourage them to take up a programme of afforestation in areas close to their villages; on the other put a temporary halt to commercial exploitation of forests, especially the Reserved Forest in order to win the peoples' confidence. The success of the first measure would depend to a large extent on the degree to which the people can be assured that the major benefits of new plantations would accrue to them. This would require considerable skill in communication and confidence-building. It may even necessitate some legislative changes in the areas of tenurial rights and security grant of usufruct/rights and amendments to some forest related laws which prohibit the felling of trees even on private lands. As far as the second measure is concerned, some steps have already been taken of the ban on green feeling on trees

above 1000 metres in the hill areas of U.P. which was introduced after the Chipko movement and the ban on contractors in forestry operations. Unfortunately these well-intentioned measures are all too often observed in the breach with the result that in the perception of the people they exist only on paper. Hence a stricts observance of the existing bans and as we agreed above a temporary halt on all commercial activities in forests may go a long way in winning the peoples' confidence, so necessary for undertaking a programme of afforestation on public and common lands.